BOEING

Solar Power Satellite System Definition Study

PHASE II

Research Planning Interim Report

D180-25381-1

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GENERAL ELECTR

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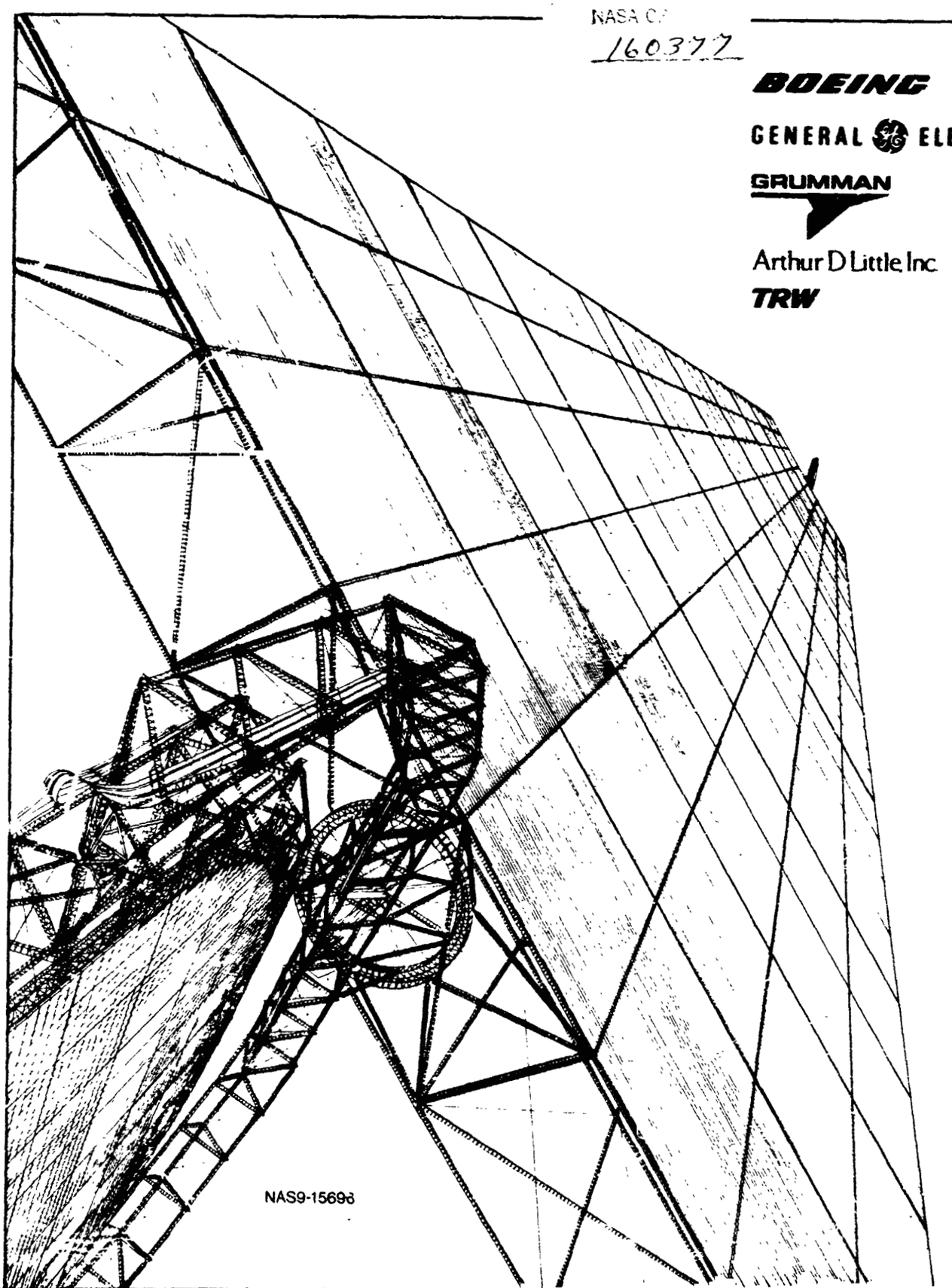

NAS9-15698

SOLAR POWER SATELLITE
SYSTEM DEFINITION STUDY
(PHASE 2)

Contract NAS9-15636

Research Planning
Interim Report

July 9, 1979

D180-25381-1

Approved by Gordon R. Woodcock
Gordon R. Woodcock
Study Manager

Boeing Aerospace Company
Ballistic Missiles and Space Division
Advanced Space Programs Group
P.O. Box 3999
Seattle, Washington 98124

SPS RESEARCH PLANNING INTERIM REPORT

Introduction and Summary

This report was prepared as part of the solar power satellite systems definition study, Contract NAS9-15636. It was developed to aid in planning for the research phase of the solar power satellite program. It is intended to serve as a data base rather than as a definitive final plan. Accordingly, it includes backup information to allow a detailed evaluation of all elements of the research plan.

The document is organized as follows:

A brief planning overview and discussion of major issues is followed by a detailed issue-oriented list of research tasks. This list contains all of the input data that were used to formulate the overall plan. Each task is described in terms of a series of questions that it is intended to answer, their relevance, their applicability (i.e., to what kinds of SPS's), a summary description of the task to be carriedout, its duration, the resources required in terms of costs for materials and special test equipment, task head count by skill, and utilization of major facilities. The task list also contains the network information that was used to perform the critical path analysis and develop the schedules. The resources data are numerically coded according to the resources library, Table 1.

TABLE 1.

RESOURCES LIBRARY

1.0 DESIGN & ANALYSIS
1.1 MECHANICAL (Includes structural, thermal, propulsion, mech. equipt. ect.)
1.2 AERO/PERFORMANCE & FLIGHT CONTROLS
1.3 ELECTRIC POWER
1.4 ELECTRIC/RF/DIGITAL
1.5 CHEMICAL/PROCESS
1.6 PHYSICS
1.7 MATH, COMPUTER SOFTWARE
1.8 INDUSTRIAL DESIGN & PLAN ENGRG.
1.9 CIVIL, FACILITIES ENGRG.

2.0 SYSTEMS INTEGRATION & ENGR.
2.1 SYSTEMS ANAYLSIS/CONFIG. DEVEL.
2.2 REQMTS & SYSTEM DOCUMENTATION
2.3 CONFIGURATION MANAGEMENT
2.4 SYSTEMS TEST ENGINEERING
2.5 SYSTEMS MANAGEMENT
2.6 HF & SIMULATION

3.0 TECHNICAL SUPPORT
3.1 AIDES, DRAFTING
3.2 CLERICAL & GRAPHICS
3.3 COMPUTER OPS.
3.4 LAB TECH - MECH.
3.5 LAB TECH - ELEC/ELEC

4.0 MANUFACTURING
4.1 MECHANICAL DEVELOPMENT SHOP
4.2 ELECTRICAL/ELECTRONIC DEVELOPMENT SHOP
4.3 MECH/STRUCT PRODUCTION SHOP
4.4 ELEC/ELECTRONIC PRODUCTION SHOP
4.5 SPECIALITY SHOP
4.6 FINAL ASSY SHOP
4.7 TEST & CHECKOUT LAB
4.8 PROCESS PLANT SHOP

5.0 CONSTRUCTION & FIELD OPERATIONS
5.1 SITE PREPARATION
5.2 BRICK & MORTAR
5.3 SITE ACTIVATION & OPERATION
5.4 LAUNCH/MISSION OPS

10.0 SPECIAL FACILITIES
10.1 LARGE-SCALE COMPUTER (370/7600 EQUIV)
10.2 SMALL COMBINED ENVIRON. CHAMBER
10.3 LARGE COMBINED ENVIRON. CHAMBER
10.4 SMALL ANECHOIC
10.5 LARGE ANECHOIC
10.6 LARGE THERMAL/VAC
10.7 SYSTEMS INTEGRATION LAB

The task descriptions are followed by a network listing that includes the short title for each task, the task numbers, the duration, and the total estimated cost for each task. The network listing also includes milestone events marking the beginning of, and decision points at the conclusion of, major research activities.

The network logic for each task area is provided as a set of drawings in the back pocket. The network logic charts also show duration of each task, the total float in the schedule, and the cost of each.

The logic networks are followed by a recommended schedule for each major task area developed using assumed resource limitations. (This schedule requires approximately one and one-half years longer to complete than the shortest possible or "early start" schedule. Schedule dates on the network logic charts apply to the early start schedule).

The schedule charts are followed by the resource analysis details. These details provide the man-loading data by skill for each task. Summary resource time spreads, accordings to the resource constrained schedule, are also contained in this section.

The final section contains cost spreads by major technical area and by overall program elements. Cost and resource utilization rate plots are in dollars and mandays per month, respectively.

SPS PROGRAM APPROACH

We have developed an overall program approach for SPS that we believe is appropriate to a new venture of this magnitude. The philosophy calls for increasing program commitments in measured steps, in response to successful fulfillment of decision criteria. This approach defers major resource commitments until a high confidence of success is established. Success is measured in terms of environmental acceptability, social, political and economic acceptability, cost confidence, and technical practicality. This overall program approach is illustrated in Figure 1. This figure shows the major activities to be conducted in each phase, the criteria to be met, and the key issues to be resolved in each area of concern. Following the research, development, and evaluation phase, the program would move into an engineering development and cost verification phase, followed by a phase of prototype construction, and finally a period of commercialization.

The duration of these phases is thought to be roughly five years each for the first two phases. One would cover the research, development, and evaluation, and the second covers engineering development and cost verification. A prototype phase lasting roughly ten years would follow. In a practical sense, divisions between the phases will be somewhat less distinct than indicated by Figure 1. We expect that, to some degree, decisions will be made incrementally and that certain activities will not fit cleanly into one phase or another. Further, some degree of overlap between the phases is possible. The amount of overlap must be selected based on a trade-off of risk versus need. Overlap of the phases would allow accomplishment of end results earlier, but would subject the program to an expenditure of a higher level of commitment before all criteria from a previous phase are met.

SPS PHASED PROGRAM APPROACH
ACTIVITIES AND DECISION CRITERIA

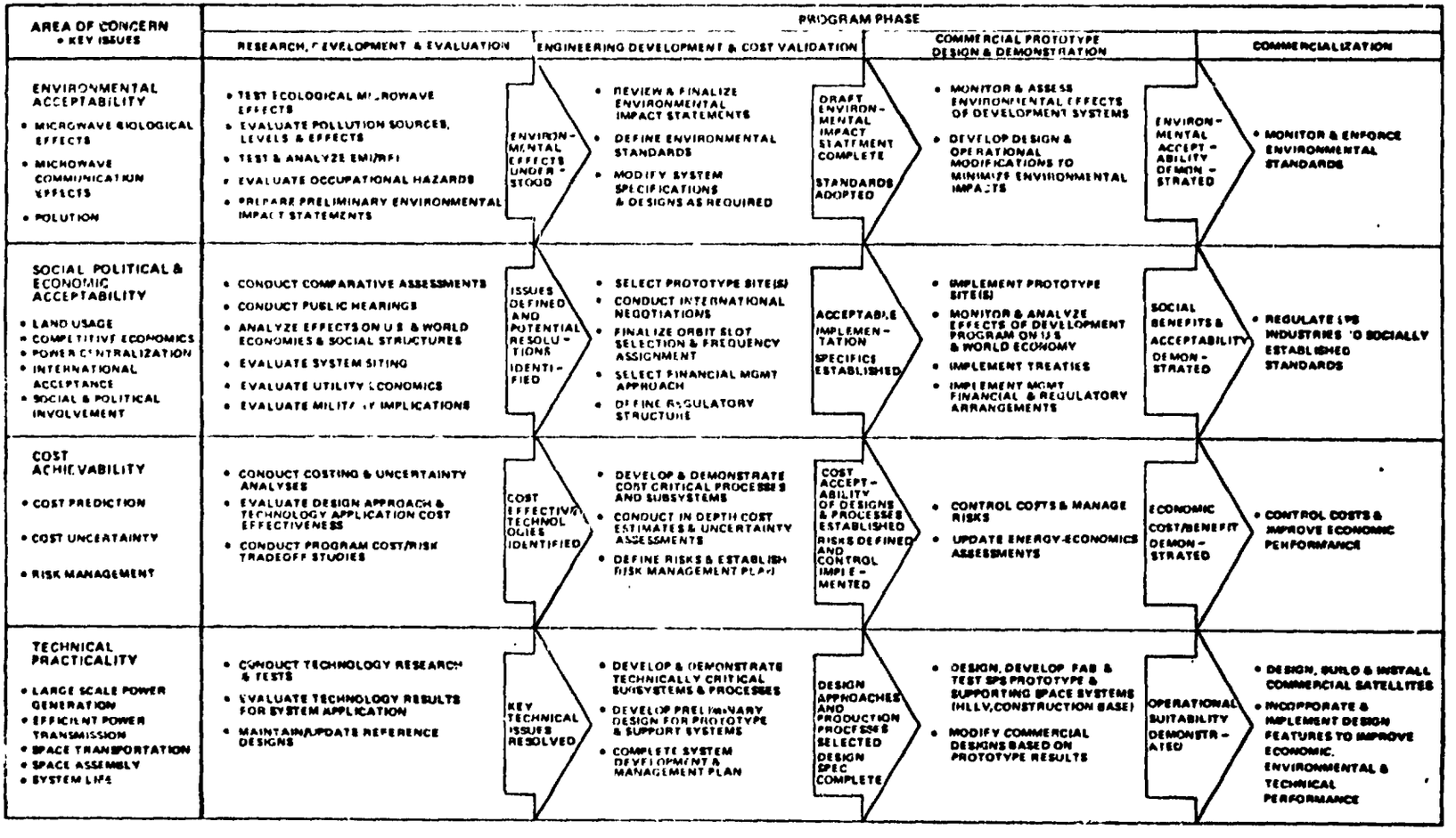

FIGURE 1

MAJOR ISSUES

The research plan was divided into eleven major technical areas. Each area was developed in terms of detailed questions and responsive tasks. The following is an overview of the research issues in each technical area.

1. Solar Arrays

   SPS solar arrays must combine significant improvements in performance and weight with major reductions inccost per unit area. Silicon and gallium arsenide arrays are the two reference options; but there is some possibility that an alternative technology will emerge and prove to be better for SPS than either of these.

   The research plan addresses the determination of which solar array technology is best suited for SPS and what solar cell and array fabrication, production, and performance restoration technologies will provide the most economic energy conversion.

2. Thermal Engines and Thermal Systems

   Earlier SPS system studies have determined that if the solar array performance and cost projected for SPS can be achieved, photovoltaic energy conversion will provide lower cost than thermal engine conversion. Thermal engines, however, represent a hedge against the possibility that the desired photovoltaic performance and cost will not be achieved. In addition, SPS's require a number of thermal control systems for heat rejection and temperature control. This research activity addresses lifetime and performance of thermal control system technologies and maintains a low-key effort to carry along the thermal engine as a viable backup energy conversion technology. (Little effort is

recommended in basic turbo-generator technology since that technology is in a relatively mature state and is being advanced in other programs.)

3. Power Transmission

Some form of directed energy beaming must be used to get SPS power from geosynchronous orbit to Earth. Most analyis up to the present time has been directed to radio frequency power transmission using a power beam frequency of 2450 megahertz. (The wavelength is 12.24 centimeters.) Some work has been done on other frequencies; recently increased interest has been expressed in power transmission by infrared or visible laser.

The major research issues in power transmission are related to the achievability of the required extremely narrow beam and high efficiencies. Related issues include the control of beam sidelobes, noise, and harmonics and the determination of the degree to which environmental concerns can be eliminated in this system. For laser transmission principal concerns are the achievement of the necessary efficiencies and high powers, and minimizing heat rejection problems.

4. Large Space Structures

The main issues in this area are the development of structural design and fabrication approaches that satisfy the SPS requirements for lightweight and constructability, and in the case of the transmitter antenna, precision and dimensional stability.

5. Materials Technology

The main issue in materials technology is demonstration of the requisite long life of the materials to be used. Selection of materials, and resolution of additional specialized issues associated with materials and their performance for some of the special applications are additional objectives.

6. System Control

The issues in this area are the controllability of these large area systems in space, suppression of unwanted structural dynamics (the latter could cause potential interference with the microwave or laser transmission system) and overall issues of control and data management as well as hardware and software architecture that will minimize problems with failures and system lifetime.

7. Space Construction

The major issues in space construction are the feasibility of constructing these very large structures and the attainability of crew and facility productivity high enough to make space construction of these systems economically practical.

8. Space Transportation

The principal issues in space transportation are achievability of adequately low freight cost, minimization of environmental concerns related to launch vehicle and orbit transfer operations and reduction of the nonrecurring costs that will be necessary to bring the space transportation fleet into being.

9. Power Distribution

   The main issues are the stability, controllability, and fault isolation and damage prevention for operation of this lightweight, high power system, and achievement of adequate lifetime for systems such as power processors and switchgear.

10. Space Environment Effects

    Principal concerns in the space environment effects are the effects of space plasmas, outgassing, and particulates in the vaccuum environment interfering with the operation of the high voltage solar arrays, power distribution, and power processing systems.

SUMMARY OF PLANNING RESULTS

The overall research program includes 173 activities, 26 milestone events, all connected by approximately 300 network precedences. The program was assumed to start in January of 1980 with an earliest possible completion date of 1 April 1986 and a resource constrained scheduled completion date of July 1987. The total program cost is $438,000,000, of which ground based research was $240,000,000 with most of the balance being associated with flight research projects.

Figures 2 and 3 show cost spreads for the early start and reference resource-constrained schedules. Figure 4 shows the overall manpower utilization by major skill for the total program. Cost and resources are shredded out at a lower level of detail of the cost package in the major part of this report.

FIGURE 2

"Early Start" Schedule Costs

SPS-2968

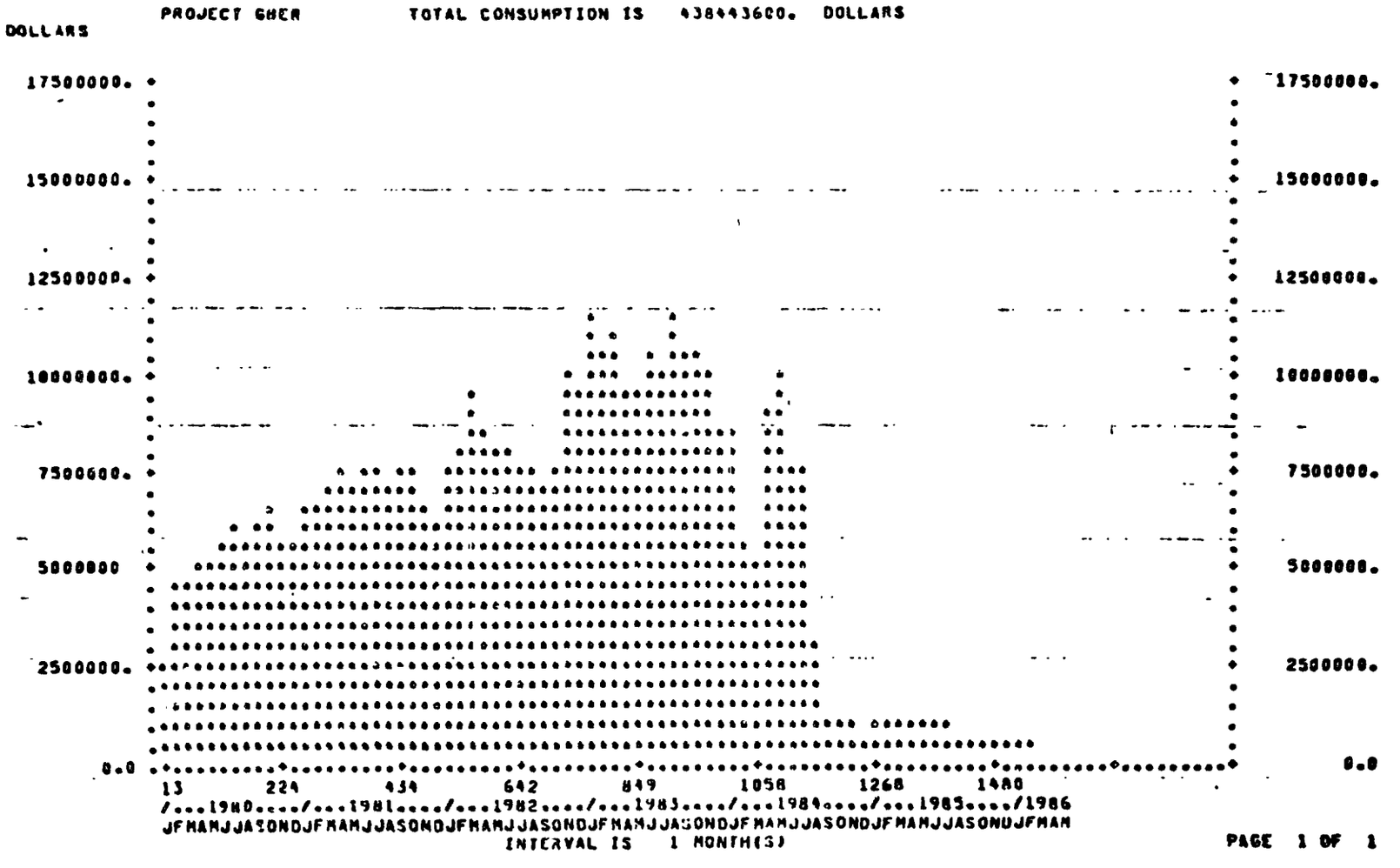

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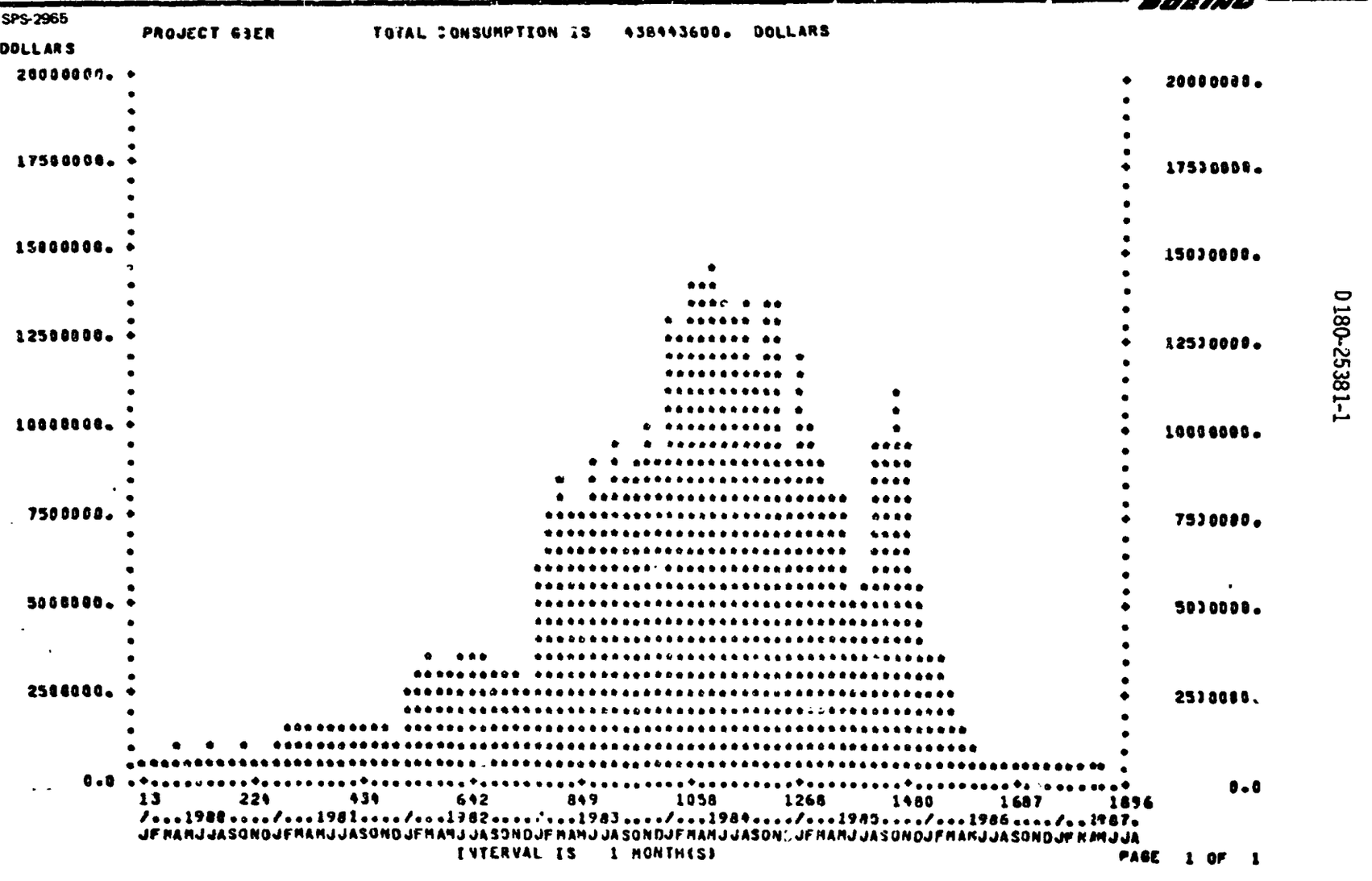
FIGURE 3

Total Research Program: Nominal Costs



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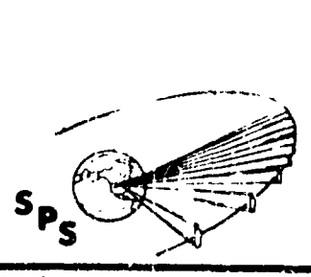

FIGURE 4

Example Resources Results (Manpower)

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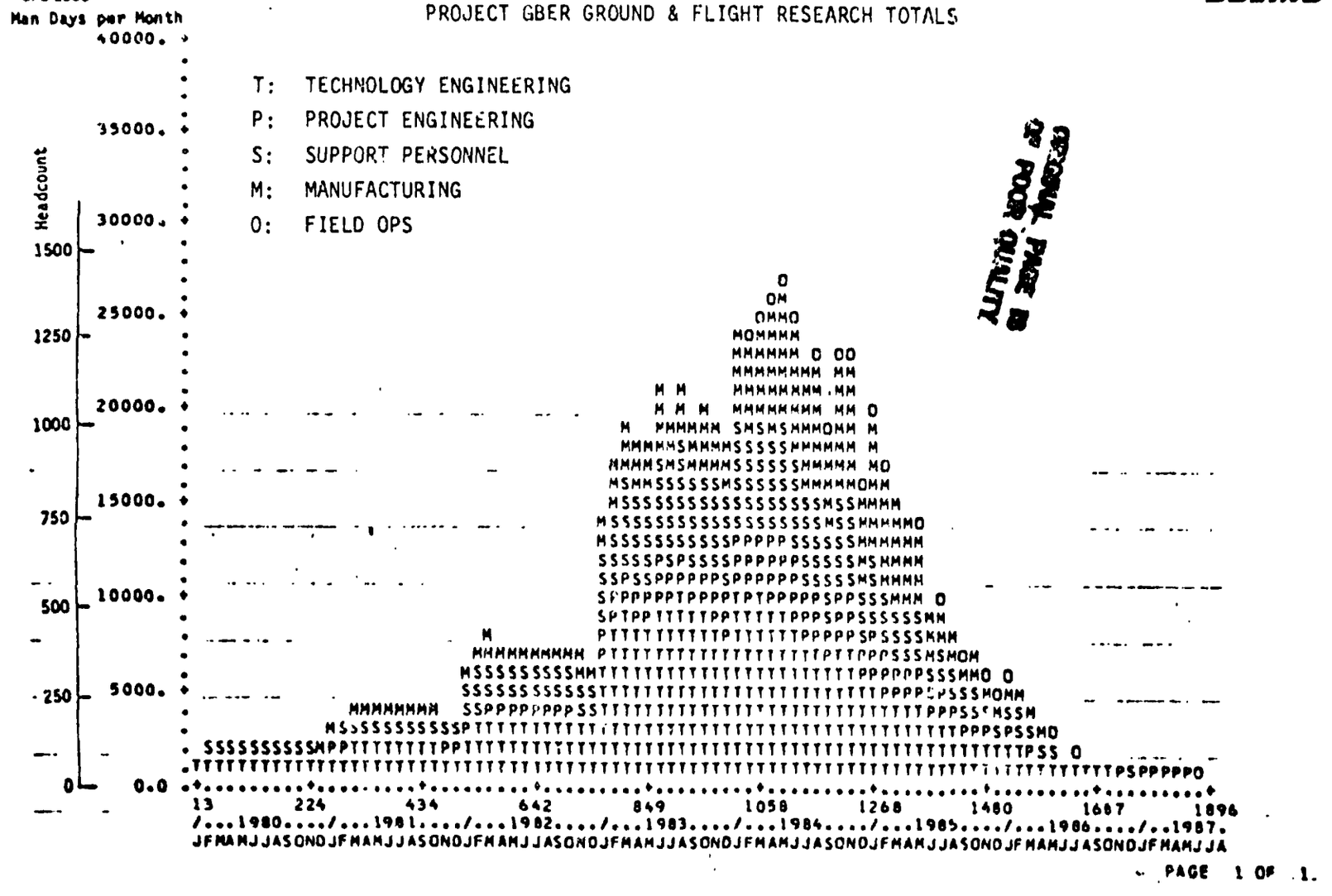

A total of four alternative schedules were examined to develop some initial understanding of schedule/funding interrelationships. Two of these alternative schedules were based on completion at the earliest date allowed by the network critical path. These are the "early start" schedule noted above and the "late start" schedule. The former initiates each task at the earliest possible date and the latter at the latest possible date, consistent with the network interrelationships and the critical path completion date. Figure 5 shows the funding profile associated with the "late start" schedule. The "early start" schedule shows how much funding could be usefully employed early in the program: about $60 million in the first year. The "late start" schedule shows how little one could get by with, and how much funding peaking occurs in later years as a result of minimizing early-year funds.

Resource-constrained schedules were generated by limiting the manpower available in early years. The software employed for this analysis adjusts the schedule to conform to these limits. Constrained schedules may take longer to complete than the nominal critical path; those analyzed here do. The constrained schedule of Figure 3 was so developed, as was the alternate constrained schedule of Figure 6. This latter constrained schedule allows slightly more early-year funding and completes the program about six months earlier than the reference constrained schedule.

Figures 7 and 8 compare the two constrained schedules with the late start schedule. (Constrained #1 is the reference schedule.) These illustrate

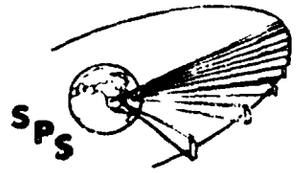

FIGURE 5

"Late Start" Schedule Costs

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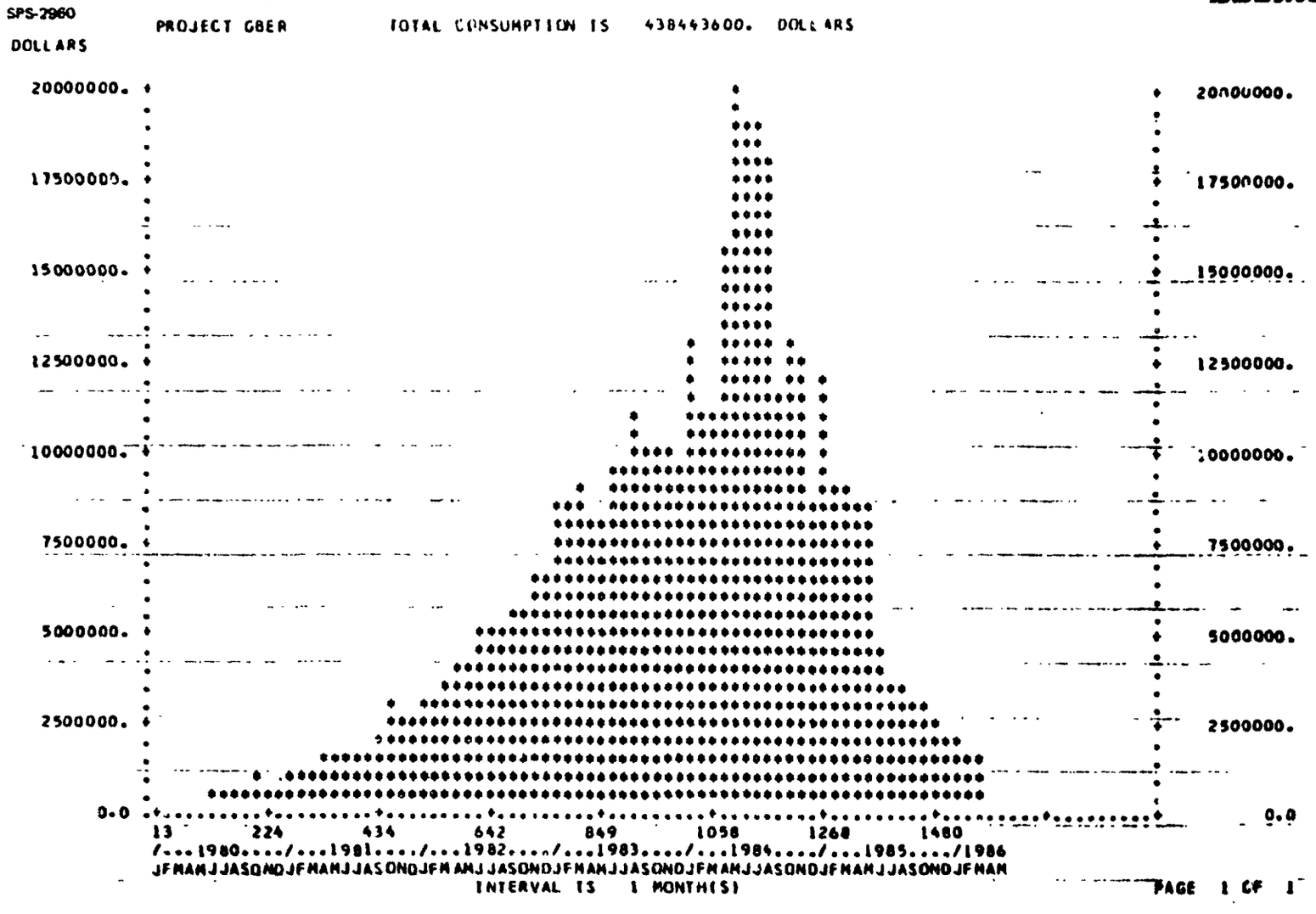

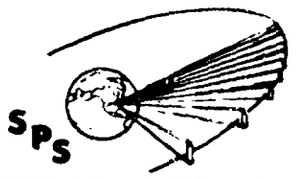

FIGURE 6

Alternate Constrained Schedule Costs

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SPS-2969

DOLLARS

PROJECT ONLY TOTAL CONSUMPTION IS 438443000. DOLLARS

20000000.
17500000.
15000000.
12500000.
10000000.
7500000.
5000000.
2500000.
0.0

200000
175000
150000
125000
100000
75000
50000
250001
0.

15 229 434 642 849 1058 1268 1480 1687 1695

/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987.

JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA

INTERVAL IS 1 MONTH(S) PAGE 1 OF 1

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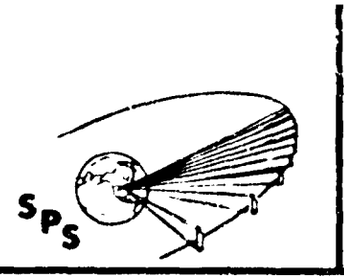

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FIGURE 7

Three Funding Options For Research Phase

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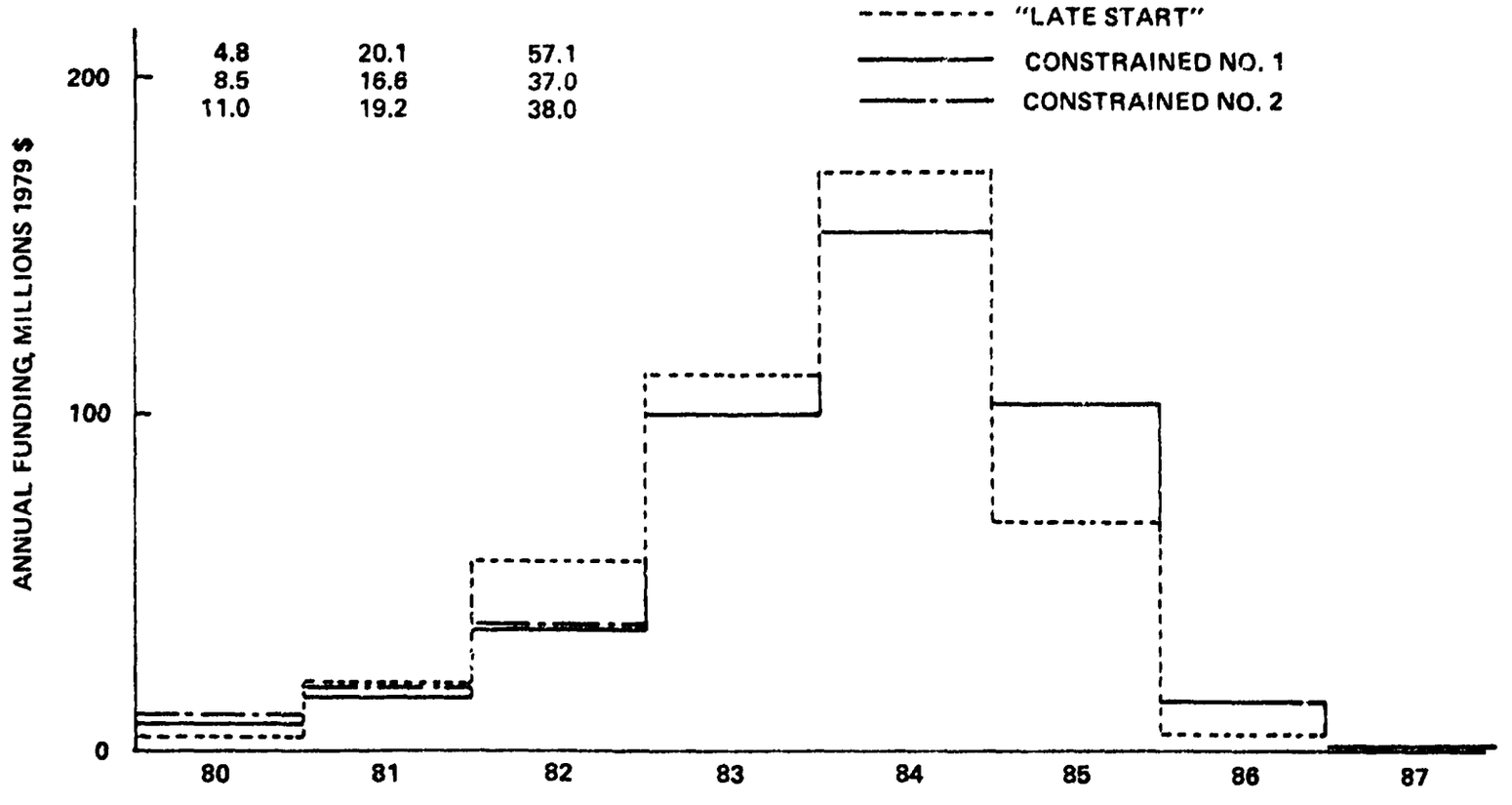

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FIGURE 8

Technology Decision Schedule Comparison

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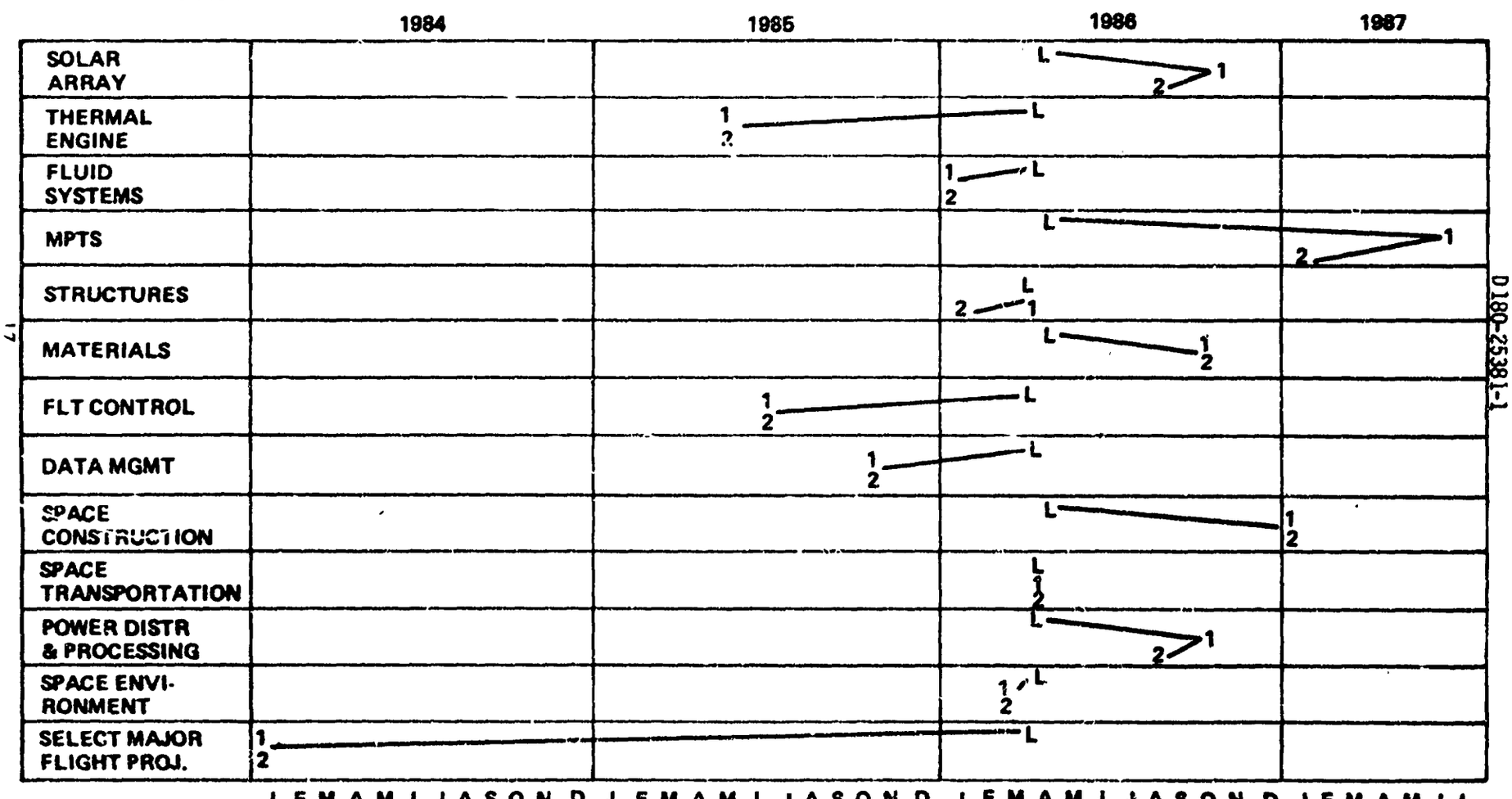

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some of the sensitivity of schedule to early-year funding. Present indications are that an increase in third-year funding to something near the "late start" level will be necessary to finish by the critical path time limit. Constraints presently applied defer major engineering on critical-path flight research projects to year #4. Additional studies of funding constraints will be included in the final issue of this planning document.

SPS RESEARCH PLANNING DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
SOLAR ARRAYS 01 (01)	SILICON SOLAR BLANKET TECHNOLOGY (010101)	What efficiency can be achieved with thin silicon solar cells?	Size and cost of solar array increase if nominal efficiency of 17% cannot be achieved.	Silicon reference SPS and EOTV	Solar cell fabrication and process development. 010101 018	750	$250K Matls & STE	010101028 SS100 010101038 SS50 010101058 SS200 011101018	3 Parallel Efforts! 1.3:1 x3=3 4.2:2 x 2 = 6 1.6:1 x3=3 3.2:1 x3=3 3.5:1 x3=3
		How much degradation will occur for various levels of radiation fluence? Do techniques such as lithium doping help?	Frequency and need for annealing and/or oversizing are dependent on degradation	Silicon reference SPS and EOTV	Radiation environment testing with statistically significant samples and range of cell types, radiation types, levels and energies. 010101 028	500 COMBINED AS ONE TASK	$250K Matls & STE	010101 048 SS 100 011101018	1.3:2 1.6:2 3.2:1 3.5:2 10.3:0.5 4.5:1
		What annealing recovery is possible and what time/temperature profiles are best?	Oversizing of silicon array is minimized with good recovery. Feasibility of silicon EOTV is dependent on recovery from deep degradation.	Silicon reference SPS and EOTV	Annealing tests on thin cells.... statistically significant and range of all types, radiation types, levels and energies. 010101 028				
		How can the thin solar cells be integrated into lightweight blankets that are compatible with annealing temperatures and long life?	A practical process is needed. Cost and energy consumption of integration processes may be significant	Silicon reference SPS and EOTV	Test and evaluate alternative techniques for encapsulating thin cells in glass blanket panels and providing interconnects and shunting diodes. 010101 038	750	$250K Matls & STE	010101048 SS 200 010101058 SS 200 010104018 SS 400	2 Parallel Efforts! 1.3:1 x2=2 3.2:2 x2=4 1.6:1.5x2=3 1.5:2 x2=4 3.5:2 x2=4 4.2:1 x2=2 4.5:1 x2=2

NOTES

(1) Durations are given in normally-scheduled work days, approx. 250 per calendar year.

(2) Non-resource costs are for materials and equipment not included in resources library.

(3) Lag notation: SS - start-to-start
FS - finish-to-start

(4) Resources are defined in resources library.
Values are headcount for each type.

(5) Task numbering code: AA BB CC DD E
AA designates program phase:
01 = ground-based research;
02 = research flight tests.
BB designates technical area, e.g., solar arrays
CC designates subject; e.g., silicon solar cells
DD designates task #
E designates priority, 0-9 with 9 highest.

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SOLAR ARRAYS	SILICON SOLAR BLANKET TECHNOLOGY	What annealing performance can be achieved on integrated blankets?	Achievability of annealing recovery is tied to blanket compatibility and effects	Silicon reference SPS and EOTV	Perform environment (radiation) and annealing tests on integrated blanket samples. 010101048	300	$100K Matls & STE	010101058 SS100 011101018	1.3:2 1.6:2 3.2:1 3.5:2 10.3:0.5 4.5:1
		What processes can be used for mass production?	Energy consumption, cost, and raw material requirements.	Silicon reference SPS and EOTV	Analyze, test, and evaluate cell/blanket production processes. 010101058	750	$750K Matls, Equip., & STE	010101068 FS-100 011101018	1.8:4 1.9:1 1.1:1 1.3:1 1.5:1 1.7:2 3.1:2 3.2:2 3.4:2 3.5:2 4.5:1 4.8:4 4.1:1 4.2:1
		What is the achievable performance of integrated blanket panels made by candidate production processes?	1) Selection of processes for engineering development. 2) Cost evaluation of the silicon technology.	Silicon reference SPS and EOTV.	Test and evaluate sample panels made by prototypical (subscale) processing equipment. 010101068	150	$50K	01 11 01 018	1.3:1 3.1:1 3.2:1 3.5:2
					Silicon Assessment (system study) 01 11 01 018	60	-	01 15 01 018 (Solar Array Technology Selection)	1.3:1 2.1:2 2.2:1 2.5:1

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SOLAR ARRAY 0101	GALLIUM ARSENIDE SOLAR BLANKET TECHNOLOGY 010102	What thin-film gallium arsenide cell technology is appropriate for SPS?	Thin-film high-efficiency technology may yield low cost.	Gallium Arsenide reference SPS and EOTV	Test cell fabrication and substrate techniques; measure performance. 010102018	850	$250K	010102028 SS200 010102033 SS50 010102058 SS200 011101028	3 Parallel Efforts! Same as 010101018
		How much radiation degradation will occur for various levels of radiation fluence? What are proton/electrons ratios, energy dependence and how does this vary with cell construction, e.g., junction depth?	Frequency and need for annealing and/or oversizing are dependent on degradation.	Gallium Arsenide reference SPS and EOTV's	Radiation environment testing with statistically significant samples and range of cell types, radiation types, levels and energies. 010102028	500	$250K	010102048 SS 100 011101028	Same as 010101028
		What annealing recovery is possible, and what time/temperature profiles are best?	A practical process is needed. Cost and energy consumption of integration processes may be significant, and quantities of gallium required are affected.	Gallium Arsenide reference SPS and EOTV	Test and evaluate alternative techniques for encapsulating thin cells in blanket panels and providing interconnects and shunting diodes. 010102038	750	$250K	010104018 SS200 010102048 SS 200 010102058 SS 200	2 Parallel Efforts! Same as 010101038
		What annealing performance can be achieved on integrated blankets?	Achievability of annealing recovery is tied to blanket compatibility and effects.	Gallium Arsenide reference SPS and EOTV	Perform environment (radiation) and annealing tests on integrated blanket samples. 010102048	300	$100K	010102058 SS 100 011101028	Same as 010101048

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SOLAR ARRAYS	GALLIUM ARSENIDE SOLAR BLANKET TECHNOLOGY	What processes can be used for mass production?	Energy consumption, cost, and raw material requirements.	Gallium Arsenide reference SPS and EOTV	Analyze, test, and evaluate cell/blanket production processes. 010102058	750	$750K Matls, Equip, & STE	010102068 FS-100 011101028	Same as 010101058
		What is the achievable performance of integrated blanket panels made by candidate production processes?	1) Selection of processes for engineering development. 2) Cost evaluation of the gallium arsenide technology.	Gallium Arsenide reference SPS and EOTV	Test and evaluate sample panels made by prototypical (subscale) processing equipment. 010102068	150	$50K	011101028	Same as 010101068
		What recovery of gallium can be achieved with bauxite and other potential sources?	Practicality of gallium arsenide SPS depends on developing an economical source of gallium with adequate production capability.	Gallium Arsenide reference SPS and EOTV	Conduct test and demonstration program for gallium recovery. 010102078	400	$100K	011101028	1.5:2 3.2:1 4.8:2 4.1:1 1.8:1
					Gallium Arsenide Assessment (Sys Study) 011101028 Milestone (Solar Array Tech. Selec.) 011501018	60		011501018	Same as 011101018

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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SOLAR ARRAYS (0101)	ALTERNATIVE PHOTO-VOLTAICS TECHNOL-OGIES (010103)	What alternative technologies are most attractive? (e.g., multiple-band gap, thin films, photo emissive, etc.). How do they affect SPS array cost? Mass (and therefore transport cost)? Are any of these potential alternatives to the present baselines or are they farther-future options?	Solar array advance-ments could enhance SPS economics in four ways: 1) lower array cost; 2) lower array mass and reduced transport cost; 3) less array area and reduced construction cost; 4) less sensitivity to radiation and reduced maintenance cost.	All Photovoltaic SPS's	Conduct research on alternative photovoltaic technologies. (010103018)	750	$250K	010103028 SS300 011101038	2 Parallel Efforts 1.3:1 x2=2 3.5:1 x2=2 1 6:1 x2=2 4.2:1 x2=2 3.2:1 x2=2
					Explore array fabrication processes. (010103028)	750	$350K	011101038 010104018	2 Parallel Efforts 1.3:1x2=2 4.2:1x2=2 1.6:1x2=2 4.5:1x2=2 1.5:1x2=2 3.2:1x2=2 3.5:1x2=2
					Evaluate performance and assess benefits and technology readiness in systems studies. (011101038)	60	-	011501018	Same as 011101038
	OPERATING ENVIRONMENT (010104)	What are the plasma, spacecraft charging, and high voltage breakdown effects that may limit SPS array voltage or dictate aspects of the solar blanket design?	If voltages must be reduced from the baseline, more mass and cost will be invested in power distribution and processing.	All SPS and EOTV designs	1) Conduct chamber environment tests of candidate array elements. (010104018)	300	$100K	011101018 011101028 011101038 010104028 SS100	1.3:1 10.2:1 1.6:1 3.2:0.5 3.4:1 3.5:1
					2) Analyze and trade off effects and mitigating design options to select most cost-effective array design, array voltage, and power distribution and processing approach (010104028)	150	-	011501018	1.3:1 1.6:1 2.1:1 3.2:0.5

NOTES

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THERMAL ENGINES & SYSTEMS (0102)	THERMAL CONTROL COATINGS (010201)	What thermal control coatings are best for SPS use? How much will they degrade in the space environment? Are there ways to restore them?	Degradation of thermal control coatings may limit performance of SPS's. Restoration techniques could be an important part of maintenance.	Reference and advanced technology SPS's	Perform long duration accelerated life tests in simulated space environment. Develop concepts for, and test. coating restoration techniques. 010201018	1250	$200K	011105018	1.1:0.25 1.5:0.25 1.6:0.25 3.4:1 10.2:0.5 (combined with 01050103B) Coordinate with Task 010501038
	THERMAL CONCENTRATORS (010202)	What ideas can be developed for high performance concentrators that would be simple to construct and operate?	Easily-constructed concentrators would improve the attractiveness of thermal engine SPS's. This option is important as a hedge against problems in achieving low photovoltaics costs.	Thermal engine SPS's photovoltaics using concentration.	Conduct studies and small-scale model tests of new or novel concentrator designs. 010202015	200	$10K	011102018 010707015 SS 100	1.1:1 2.1:1 3.1:0.5
	THERMAL ENGINES (010203	What improvements can be made in the thermal engine SPS design concepts of 1977?	Design simplicity would increase viability of thermal engines as a hedge against high photovoltaic costs.	Alternative SPS's	Conduct design and systems analysis studies of thermal engine SPS's. 011102015	300	-	010202015 011102028	Same as 01102028
					Thermal Engine Assessment 011102028	60	-	011502018 011102038	1.1:1 3.2:0.5 1.7:1 3.1:1 2.1:1 10.1:0.01

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THERMAL ENGINES & SYSTEMS	THERMAL ENGINES (010203)	Can advanced ceramics technologies be applied to turbines or heat exchangers?	Performance of thermal engine SPS's would be much enhanced if cycle temperatures could take advantages of ceramic temperature ranges	Alternative SPS's	1) Research ceramic turbine parts and heat exchanger elements (augment existing research). 010203015 2) Evaluate benefits of ceramics for thermal engine SPS applications. Part of 011102015	750	$50K	011102028	1.1:2 1.5:0.5 3.1:1 3.4:1 3.2:0.5 4.1:0.5 4.5:0.2
	FLUID SYSTEMS (010204)	What is the best way to provide meteoroid protection for fluid and other SPS systems?	Meteoroid punctures dominate life expectancy for fluid systems and can influence life of other systems.	Primary: thermal engine systems. Secondary: large heat rejection systems	Analyse, design, test, and evaluate alternative fluid joint systems, e.g., brazed sleeves, butt weld, and joint fabrication, repair, and inspection techniques. Tests include hv impact. 010204017	450	$50K	011102028	1.1:2 1.6:0.5 3.1:1 3.4:1 4.1:1 4.5:0.5

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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THERMAL ENGINES & SYSTEMS	FLUID SYSTEMS 010204	What performance can be achieved from heat-pipe radiators in the 70°C-500°C temperature range? What life?	Heat pipe performance is critical to microwave tube and power processor cooling.	All SPS designs.	Design, test, and evaluate various heat pipe designs and fluids over a range of temperatures and thermal powers. Coordinate with microwave amplifier and power processor research. 010204027	500	$50K	010204017 SS 200 010204047 SS 200 010204067 FS-100	1.1:0.5 1.6:0.5 3.1:0.5 3.4:1
		What performance can be achieved with circulating systems? What life and reliability?	Circulating systems are an alternative to heat pipe and may be more applicable to systems with large concentrated thermal loads.	All SPS designs.	Design, test, and evaluate circulating systems over a range of temperatures and thermal powers. 010204037	500	$50K	010204017 SS 200 010204047 SS 200 010204067 FS-100	Same as 010204027
		What techniques for in-space assembly, inspection, and repair are suitable for use with SPS fluid systems? How can one minimize risk of damage from fluid leaks?	Long service life and high reliability will require occasional repair, e.g., of meteoroid puncture.	All SPS systems that may involve use of fluids.	Analyze, design, test, and evaluate various candidate approaches for inspection, removal, patching, replacement, in-situ repair, and fluid recharging. Cover a range of fluids, types of systems, and operating temperatures. 010204047	300	$50K	011102028	1.1:0.5 2.6:0.5 1.5:0.5 3.2:0.5 3.3:0.5 4.5:1 4.1:1

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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THERMAL ENGINES & SYSTEMS	FLUID SYSTEMS	What heat transfer performance can be expected at zero-g, especially if phase change is involved?	Certain heat transfer problems will involve phase change, e.g., heat pipes; thermal engine boilers and condensers.	Unclear but probably most SPS designs.	Test, analyze, and evaluate zero-g heat transfer under nucleate and film boiling, condensing, and heat pipe conditions. Drop towers, etc., can be used but shuttle flights may be needed. 010204057	400	$50K	011102028	1.1:2 1.6:0.5 3.1:1 2.1:0.5 3.4:1 4.1:1
		What performance can be obtained from integrated thermal radiators?	Some aspects of SPS design are constrained by available heat rejection area and attainable heat rejection performance.	All SPS design, especially power transmitters and power processors.	Design, analyze, test, and evaluate integrated radiator systems, including heat pipe or circulating fluid elements and thermal control coatings. 010204067	400	$50K	011102038 010204088 SS250	Same as 010204057
		What materials and processes will be needed to ensure long-life containment of liquid metals?	If liquid metals are used, e.g., in klystron cooling heat pipes, leaks in high-voltage areas could lead to serious damage.	Klystron cooling; thermal engines	Perform long-life accelerated corrosion and transport tests with mercury and sodium heat pipes. 010204078	700	$50K	011102038	1.1:1 1.5:0.5 3.4:0.5 4.1.0.5 3.2:0.5
					Thermal/Fluid Overall Systems Assessment 011102038	150	-	011102028	Same as 011102028

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THERMAL ENGINES & SYSTEMS	FLUID SYSTEMS	What production processes can be employed to obtain high rates, high quality, and low cost for integrated radiators.	Thermal control systems are second in cost importance for the reference power transmitter	Reference SPS'e and thermal engines	Study, analyze and prototype test manufacturing techniques 010204088 Thermal Engine Technology Continuation decision. 011502018M	500	$100K	011102028	1.1:1 1.6:2 4.1:1 4.8:1 3.2:1 FLUID SYSTEMS TECHNOLOGY SELECTION 011502028
POWER TRANSMISSION	RF AMPLIFIERS	What efficiency can be achieved with a klystron? What is the best compromise of cavity design, circuit design, and depressed collector design for maximum efficiency? How much noise and harmonics are generated by the tube?	High DC-RF conversion efficiency is essential to minimizing SPS costs. A confident estimate of tube efficiency must be in hand to finalize the transmitter specifications.	Reference SPS designs.	Analyze, develop, test, evaluate, and iterate the basic klystron RF configuration design. 010301019	750	$100K	010301029 SS200 010301038 SS400 010301046 SS400 010304019 SS250	1.1:0.5 1.4:2 3.1:0.5 3.2:0.5 3.5:2 4.2:2 4.5:1
		What is the best way to thermal control the klystrons?	Heat removal is a key design consideration in klystron design. A mature thermal control design will minimize failure problems.	Reference SPS designs.	Analyze and test heat pipe and circulating cooling schemes over a range of temperatures. Marry with klystron tube under development and conduct integrated tests. 010301029	600	$100K	010301038 SS250 010301119 SS250 011103019 SS250	1.1:2 1.4:0.5 3.1:0.5 3.4:0.5 4.1:0.5 4.7:0.5

NOTES

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POWER TRANS-MISSION	RF AMPLIFIERS	Can the klystron be designed for semi-automated assembly and to avoid extensive burn-in or tune-up testing? Can precision manufacturing produce cavities on frequency?	Test and checkout labor may be a large contributor to production tube cost. Careful design and process development to minimize this would have a large payoff.	Reference SPS designs.	Carry out integrated tube design and test activities, and manufacturing and process development. 010301038	500	$100K	011103029	1.1:0.5 1.4:1 1.8.1 3.1:1 3.5:1 4.8:2 3.2:0.5
		Can permanent magnets be used to reduce tube mass and parasite power consumptions?	Significant reduction in mass and improvement in efficiency.	Reference SPS designs.	Analyze, design, and test PM options. 010301046	200	$10K	011103029	1.1:1 3.2:0.5 1.4:1 3.5:1 4.1:1
		What efficiency can be achieved with a magnetron or amplitron? What is the best way to use this device, i.e., as an amplifier or as an oscillator in a directional amplifier configuration? How much noise and harmonics are generated by these configurations?	The magnetron (or amplitron) is a potential alternative to the klystron. The preferred approach is not yet determined.	Alternate SPS designs using magnetrons in place of klystrons.	Analyze, develop, test, evaluate and iterate the basic magnetron/amplitron design. Trade-off the two approaches and select the best. 010301059	750	$100K	010301069 SS200 011103019 SS100 010304019 SS200	1.1:0.5 1.4:2 3.1:0.5 3.2:0.5 3.5:2 4.2:1 4.5:0.5

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POWER TRANS-MISSION	RF AMPLIFIERS	What is the best way to thermal control the magnetrons? How does this vary with tube power level?	Heat removal is a key design consideration. Earlier studies assumed passive (conductive fin) thermal control, resulting in limitations of power per tube. Higher tube power may be desirable and can be facilitated by semi-active thermal control.	Alternate SPS designs using magnetrons in place of klystrons.	Analyze thermal control effects or tube design point and integration considerations Analyze, test, and evaluate alternative thermal control techniques. 010301069	400	$50K	010301078 SS 200 011103029 010301119 SS 250 011103019 SS 250 011103029	1.1:1 1.4:0.5 4.1:1.0 3.4:0.5 3.1:0.5
		Can a combination of design approach and precision manufacture avoid the use of active devices and/or test procedures for tube tune-up?	Test and checkout labor may be an important contributor to tube costs. Elimination of active devices will improve reliability and reduce maintenance.	Alternate SPS designs using magnetrons in place of klystrons	Carry out integrated tube design and test activities, and manufacturing and process development. 010301078	500	$100k	011103029	Same as 010301038

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POWER TRANS-MISSION	RF AMPLIFIERS	What kinds of solid-state microwave amplifier devices are most applicable to SPS use? What efficiency can be expected? What life? What operating temperature limitations. How much power per device? How much radiation protection will they need?	Solid-state RF amplifiers can be expected to have longer life and require less maintenance than tubes. They will, however, have more stringent temperature limitations, be more sensitive to radiation, and exhibit relatively low power per device. Their characteristics need to be defined to assess their advantages and disadvantages.	Alternate SPS designs using solid-state microwave amplifiers. Power per RF link will probably be in the 2 to 4 gigawatt range.	Fabricate and/or purchase and test amplifier devices with potentially attractive characteristics. 010301089	400	50K	010301099 SS 50 011103019 SS 50	3 efforts 1.6:0.5 x 3 = 1.5 1.4:1 x 3 = 3 3.1:0.5 x 3 = 1.5 4.2:1 x 3 = 3 3.2:1 = 3
					Design, fabricate, test and evaluate high efficiency amplifiers, e.g., switched-mode types. 010301099	400	20K	010301109 SS 100 010301119 SS 50	1.4:1.5 1.1:0.5 3.1:0.5 3.5:1 4.2:1
		What production processes can be used to achieve high-rate, low-cost production for solid-state amplifier and related devices? Can the amplifier and related preamp and control circuitry be integrated on a low-cost chip?	Current gallium arsendie FET's cost on the order of $100/watt. Costs need to be reduced to the 5¢ to 10¢ per watt range.	Alternate SPS designs using solid-state microwave amplifiers.	Design integrated GaAs FET amplifiers. Devise and test production processes suitable for desired cost targets at high rates. Test and evaluate units produced by these processes. 010301109	500	50K	011103029 010304019 SS 50	1.4:1 1.1:1 1.8:1 3.1:1 3.2:0.5 4.2:1 4.4:0.5 4.8:0.5

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POWER TRANS-MISSION	RF AMPLIFIERS & CIRCUITS	How can solid-state amplifiers be integrated with radiating elements to achieve efficient coupling and combining of the amplifiers so that RF power generated is efficiently radiated? How can these designs be formulated to maximize heat rejection capability? What will be the noise and harmonics performance of the integrated amplifier-radiator?	The solid-state systems may require a much different approach to radiator design. Efficient combining and efficient heat removal and radiation are potential problems. Unless high-q output circuits can be used, noise and harmonics from high-efficiency amplifiers may be a problem.	Alternate SPS designs using solid-state microwave amplifiers	Integrate representative amplifiers with couplers and radiators. Test and evaluate various design approaches. Measure efficiencies and noise and harmonics. Evaluate heat rejection capability. 010301119	500	$50K	010304048 SS250 010304019 SS250 010302079 SS150 010304038 SS250	7 efforts 1.4:1.5 x 2 = 3 1.1:0.5 x 2 = 1 3.1:0.5 x 2 = 1 3.5:1 x 2 = 2 4.2:1 x 2 = 2 3.2:0.5
		Are there other potential amplifier devices (of either tube, solid state, or hybrid nature) that should be evaluated (and possibly developed) for SPS?	New or alternative amplifiers may provide important advantages for SPS application, e.g., high efficiency; low noise.	Alternative SPS design.	Survey literature and technology; select candidate devices and conduct exploratory tests; evaluate for SPS application. 010301128	400	$20K	011103019 FS-100	1.4:1 1.6:0.5 4.2:1

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POWER TRANS-MISSION 0103	PHASE CONTROL 010302	What phase control systems are applicable to SPS microwave power transmission?	Phasing of RF amplifiers must be maintained within about 10 degrees (one-sigma) over the entire aperture in order to obtain high efficiency and minimize spurious emissions.	All SPS designs	1) Continue analysis and definition of spread spectrum retrodirective baseline. 010302019	400	-	010302039 SS 20 010302049 SS 50 010302069 SS 50 011103019 SS 50	1.4:2 1.7:1 3.1:0.5 3.2:0.5
					2) Investigate alternatives such as traveling-wave interferometry; two-tone pilot. 010302029	400	-	010302039 SS 20	2 parallel efforts 1.4:2 x 2 = 4 3.2:0.5 1.7:1 x 2 = 2 x 2 = 1 3.1:0.5 x 2 = 1
					3) Breadboard test and evaluate promising options. 010302039	400	$20K	010302049 SS 50 020302019 SS 50	2 parallel efforts 1.4:2 x 2 = 4 3.1:0.5 x 2 =1 1.1:0.5 x 2 = 1 3.2:0.5 x 2 =1 1.7:0.5 x 2 =1 4.7:1 x 2 =2 3.5:1 x 2 =2
		What means of distributing phase reference signals on the transmitter is best? What network topology should be used? What frequency should be used? What types of phase conjugation and regeneration circuits should be used? How much redundancy is needed?	The accuracy of phase control is dependent on the precision of phase distribution. Transmitter cost, mass, and maintenance requirements are also involved. EMI attenuation, and signal discrimination may be problems.	All SPS designs	1) Design and test elements such as fiber optic links, power splitters, phase conjugation and regeneration circuits, etc. under realistic operating conditions. 010302049	400	$20K	010302059 SS 100	Same as 010302039
					2) Conduct analytic simulations based on test results and select most favorable options. Part of 011103019				
					3) Breadboard and brassboard selected options for integrated test and evaluation. 010302059	400	$20K	011103029 FS-100 010304019 SS 200	Same as 010302039

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POWER TRANS-MISSION	PHASE CONTROL	What approaches are most suitable for phase control receiver implementation. Can receiver-on-a-chip" techniques be used? What are the sensitivities, phase errors, costs? How does the cost of pc receiver & distribution circuitry affect the selection of pc system topology & level to which active phase control is distributed.	Phase control receiver design is central to complete definition of the phase control system: method of implementation on the transmitter, cost-optimal level of distribution; thermal control; uplink signal acquisition; sensitivity & phase errors.	All SPS systems using retro-directive phase control.	1) Perform preliminary design studies of pc receivers. 2) Analyze as system element and select best approaches. 3) Design and test breadboard/brassboard receivers. 010302069	300	20K	011103019 SS 50 020302019 SS 100 010304019 FS-50	Same as 010301099
					4) Evaluate test results and finalize design approach. Part of 011103019	/	/	/	/ /
		What means of receiving the uplink signal is best? (This assumes the use of a retrodirective system as in the baselines) How can the uplink signal be coupled to phase control receivers?	The uplink signal must be close in frequency to the power signal, yet enough separated to allow discrimination Diplexing from the po power signal distribution system may be practical, and utilizes the entire transmitter as receiver aperture. Transmitter bandwidth is an issue. A solid-state transmitter may be entirely different in design than the waveguide baseline and may require a unique approach.	All SPS systems using retro-directive phase control.	1) Test baseline antenna design for bandwidth, phase distortion, and diplexing feasibility. 2) Test alternate designs especially those for solid-state systems. 010302079	400	40K	011103019 SS 50	1.1:0.5 4.1:0.5 1.3:0.5 1.4:0.5 4.2:0.5 3.1:1 3.2:0.5 3.4:0.5 3.5:0.5
					3) Analyze results to ascertain suitability for spread-spectrum and two-tone uplinks. Determine uplink power/gain required. Select most practical system design approaches. Part of 011103019	/	/	/	/

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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POWER TRANS-MISSION	PHASE CONTROL	Will ionospheric disturbances or irregularities perturb the retrodirective uplink signal in a way that degrades beam-forming performance? Are there mitigating strategies, e.g., ground commanded compensation, that will negate or minimize such effects if they exist?	Adequate control of beam forming, pointing, and sidelobes depends on the ionosphere having reciprocal properties for up and downlinks. There is some evidence that multipath conditions sometimes exist.	Any SPS design that uses retro-directive phase control.	1) Continue and extend analytic investigations of ionosphere effects 2) Employ measurements using existing satellites where practicable 010302089	1000	-	011103029	1.6:1.0 1.7:0.5 10.1:0.01
					1) Design, develop, and test at GEO a "large aperture phase array technology satellite" to confirm phase control operation. This satellite should be capable of testing alternative techniques (Phase A in SYS studies) Phase B 020302019	200	-	020302028 FS 60	2.1:1x2 1.4:1x2 3.2:1x2 2.2:1x2 1.1:1x2 1.7:1x2 1.3:1x2 2.5:1x2 3.1:2x2
					Design 020302028	375	-	020302038 SS 300	2.1:10 2.5:10 1.4:25 3.1:10 2.2:12 1.1:15 1.6:5 3.2:7 2.3:14 1.3:4 1.7:5 3.3:2 10.1:01

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POWER TRANS-MISSION	PHASE CONTROL				Fab 020302038	300	1,000,000	020302048 SS 150	1.3:3 1.4:10 2.1:5 1.1:9 2.2.9 4.1:4 4.3:40 2.3:5 2.5:10 4.2:5 4.4:40 4.5:10 4.6:20
					Test & C/O 020302048	200	250K	020302058	2.1:3 1.1:5 1.4:10 3.2:10 2.2:6 10.6:25 3.5:15 1.3:2 1.6:1 3.3:1 2.3:4 4.7:20 4.3:10 4.5:2 3.1:7 10.1:.01 2.5:10 3.4:7 4.4:10
					Launch 020302058	90	$25M	020302068	1.1:2 1.3:2 1.4:2 2.3:2 2.5:2 3.1:3 3.2:2 3.4:5 3.5:5 4.7:10 5.4:10
					Flight 020302068	400			2.5:2 1.4:4 3.3:1 3.1:1 2.1:2 1.6:2 1.7:1 3.2:2 5.4:5 10.1:0.02

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POWER TRANS-MISSION	IONOSPHERE EFFECTS 010303	Will power beams adversely affect the ionosphere or create disturbances such as thermal instabilities that in turn may influence or scatter the power beam? What power density and/or beam size limits should be specified to prevent ionosphere problems? Will scattering from severe weather systems increase RFI or sidelobe levels?		All SPS's that use microwave power transmission.	1) Continue and extend ionosphere heating studies. 030303019*	750	$2M	011103029	1.1:0.5 3.1:1 4.5:1 1.3:1 3.2:1 1.4:3 5.3:3 1.6:2 4.1:1 1.7:1 4.2:1
					2) Perform analyses and tests of scattering effects 030303029*	400	100K	011103029	Same as 010303019
					3) Assess results and reflect any impacts in systems studies. (Part of 011103019)				
	SUBARRAY OR ANTENNA ELEMENT INTEGRATION 010304	Do the subarray designs (all types: klystron, magnetron, solid-state) properly integrate all requirements and constraints, i.e., structural, thermal, rf amplification and radiation, uplink reception, phase control, DC power supply, and arc suppression and other amplifier protective measures? Does the resulting power signal exhibit acceptable signal purity and phase stability?	A successful power transmission system must respect all requirements and constraints. A careful design integration job must be done to minimize cost, risk, and operating problems.	All SPS's using microwave power transmission	1) Continue integration design studies under system studies (Part of 011103019)					
					2) Design, fabricate and test subscale or prototype integrated subarrays. 010304019	700	100K	011103029 010305019 SS 100	1.1:2 3.2:0.5 3.1:0.5 1.3:0.5 3.4:1 3.5:2 1.4:2 4.1:1 3.1:1 4.2:2 10.5:0.5
					3) Use test results to improve and finalize subarray design approaches. (Part of 011103019)				

* NOTE: 03 designates DOE tasks carried here for completeness.

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POWER TRANS-MISSION	SUBARRAY OR ANTENNA ELEMENT INTEGRATION	What low-coefficient-of-expansion materials approach is best suited for distribution and waveguides? What are the effects of power level and thermal cycling? How well can aluminum waveguides be made to work?	A low CTE waveguide has significant cost and beam precision payoff. A fully satisfactory approach has not been identified.	All SPS designs using waveguides for rf distribution or radiation.	Test various low CTE approaches and aluminum under representative SPS operating conditions; select preferred approach. 010304028	150	$10K	010304019 011103029 010304038	1.1:1 1.4:0.5 1.5:1 3.1:0.5 4.1:1
		Do multipactor effects constrain power levels on other aspects of distribution or radiating waveguide designs?	The SPS reference design is in the multipactor risk range. Multipactor will cause unacceptable degradation of waveguide hardware.	All SPS designs using waveguides for rf distribution or radiation.	Test for multipactor effects; alter design as necessary to eliminate. 010304038	300	$10K	011103029 010304019 SS 100	1.1:1 1.4:1 1.6:0.5 3.2:0.5 3.4:0.5 3.5:0.5 4.1:0.5 10.2:0.5
		What lightweight materials or design approaches could minimize mass/area, especially for solid state transmitter?	Low mass/area approaches could make large-aperture techniques much more attractive.	All SPS's using microwave transmission	Design, test and evaluate low mass/area techniques 010304048	300	$10K	011103029	1.1:1 1.4:1 1.5:0.5 2.1:0.5 4.1:1 4.2:1 3.1:0.5 3.2:0.5

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POWER TRANS-MISSION	ANTENNA POWER DISTRIBU-TION 010305	Will the power processing and distribution system cause modulation of the power beam due to internal EMI? Can transients and arcs be prevented or controlled to prevent or at least limit damage to the system?	Chopping-frequency EMI effects could modulate the power beam unless appropriate preventative design measures are adopted. Transient damage is a potential risk in any high power system.	All SPS's except those that may use solar pumped lasers.	1) Analyze transient and EMI effects. 2) Select design approaches to mitigate. 010305019	400	-	010305028 SS300	1.3:2 1.7:1 1.1:0.5 2.1:0.5
					3) Conduct simulations and subscale tests. 010305028	200	$10K	011103029	1.1:1 4.1:1 1.3:1 4.2:1 3.1:1 3.5:1 3.2:015
		Can series-parallel connection schemes be used to minimize power processing requirements for solid-state SPS's?	Power processing requirements can result in 10% to 20% cost increases in SPS hardware. Series-parallel interconnect could minimize this impact.	Solid-state SPS	1) Conduct through simulation and analysis. 010305038	200	-	010305048 SS 150	1.3:1 3.1:0.5 1.4:0.5 1.7:0.5
					2) Test series-parallel connected subarray or partial subarray. 010305048	300	$50K	011103029 010304019	1.1:0.5 4.1:0.5 1.3:1 4.2:1.5 1.4:1 3.5:1 3.1:1 3.2:015
	STRUCTURE DYNAMICS 010306	Will mechanical vibrations influence performance of the power transmission system? Can undesirable oscillations be suppressed?	Structural oscillations, if of sufficient amplitude, could affect phase control of the power transmitter.	All SPS's using microwave power transmission	1) Develop definition of structure design including joint characteristics; define representative forcing functions. 2) Perform structure/control dynamics analyses to assess severity of this problem. 3) Analyze and simulate suppression techniques. 010306018	400	-	011103029	1.1:1 1.7:2 10:1:0.01 3.2:0.5

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POWER TRANS-MISSION	ANTENNA MECHANICAL POINTING 010307	What is the best arrangement for achieving the requisite mechanical aiming precision (about one arc-minute)? Should distributed sensing and actuation be used? Should sensing of the desired aim point be derived from the uplink signal or from some independent (e.g. stellar-inertial) source? How can the electrical and mechanical rotary joints be designed to minimize the impression of structural and control dynamics noise on the transmitter?	Precision aiming is required to maximize gain and minimize grating lobes. Dynamic noise, unless confined to small amplitudes, may degrade phase control or cause phase modulation of the power beam. Mass and cost of the aiming and control systems are predicted to be an appreciable part of overall SPS mass and cost.	All SPS's employing microwave power transmission	1) Develop adequately detailed integrated dynamics models of candidate SPS configurations. (Part of 010401017)	/	/	/	/
					2) Simulate and analyze aiming systems and develop a cost-effective design approach. 010307018	200	-	011103029	1.1:2 3.2:0.5 1.2:1 1.4:1 1.7:1 10.1:01

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POWER TRANS-MISSION	ANTENNA MECHANICAL POINTING								
	BEAM SAFETY 010308	Can potentially hazardous incursions (e.g., aircraft; balloons, etc.) into the power beam be sensed? Can the power beam be shut off quickly enough without damage to the SPS? Are the appropriate emergency measures compatible with power grid operations?	Although SPS beams would presumably be marked as prohibited on aeronautical charts, air traffice might occasionally stray into a power beam. A means of detecting such entry and shutting off the beam may be necessary	All SPS's using microwave power transmission	1) Analyze sensor systems (e.g. using doppler detection of scattered radiation) that can be employed. 2) Define automated processing schemes that can avoid false alarms and provide adequate beam safety. 3) Incorporate results in systems studies and assess impact on grid operations. 010308019	400	-	011103029	1.1:1 1.4:3 1.7:1 3.1:1 3.2:0.5

D180-25381-1

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POWER TRANS-MISSION	LASER TRANS-MISSION 010309	Can laser power transmission provide acceptable SPS economics? Are there combinations of laser power generation, transmission, and reception technologies that can compete with microwave transmission? Specifically, 1) Can closed cycle lasers be operated over periods of years at high efficiency? 2) Can adequate beam control be achieved with high-efficiency multi-link lasers? 3) Can direct solar pumping achieve adequate performance? 4) Are FEL's a promising option? 5) What is the best way to work around atmosphere/weather cutoff problems? High intensity? Alternate receivers? Receivers in favorable locations? Just live with the problem?	Laser power transmission would circumvent the environmental concerns associated with microwave power transmission (and would perhaps raise new ones). Because of the much shorter wavelength, laser transmitters would be suited to much smaller apertures and lower link powers than microwave transmitters.	Alternative SPS's using laser power transmission	Because of the relative immaturity of this technology, research tasks and objectives may change substantially during the five-year period. Representative early tasks:	/	/	/	/
					1) Assess conventional, solar-pumped, and free-electron lasers. Perform laboratory measurements of efficiency, beam quality, and performance degradation vs. time. 010309019	750	$100K	011103019 SS100	1.1:0.5 4.1:1 1.3:0.5 4.2:1 1.4:0.5 4.5:1 1.6:2 3.1:0.5 3.2:0.5
					2) Conduct experiments with photovoltaic conversion of laser light to confirm high efficiency potentials.010309029	400	$20K	011103019 SS100	1.3:0.5 1.6:1.0 3.1:0.5 4.5:1
					3) Explore (experimentally) rectification, plasma approaches, and inverse FEL's. 010309039	600	$150K	011103019 SS100	Same as 010309019
					4) Assess laser options in systems studies. Part of 011103019	/	/	/	/

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		6) What approaches offer promise for efficient reconversion (to electricity)? Photovoltaics? IR rectification? Plasma devices (e.g., telec)? High temperature thermal engines? Inverse FEL's?							

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POWER TRANSMISSION	POWER RECEPTION 0103310	What is the best rectenna element design approach? Will high gain elements pay off? What is the best way of combining elements to provide filter assemblies, or should they be combined? What can be done to reduce reradiated noise and harmonics without undue degrading efficiency?	Rectenna efficiency is a most significant parameter in the overall cost of the SPS, as the size, mass, and cost of the SPS itself is generally proportional to rectenna efficiency. The rectification process generates noise and harmonics that may introduce RFI problems unless adequately suppressed. The rectenna itself represents 20-25% of the SPS system cost	All SPS's employing microwave power transmission	1) Analyze various rectenna configurations, select promising candidates for candidates. 0103310019	200	-	0103100029 SS100 0111003019 SS100	1.1:0.5 3.2:0.5 1 3:0.5 1.4:1 1.7:0.5
					2) Fabricate and test rectenna elements under carefully controlled conditions. Try various receiver, combiner, and rectifier/filter combinations. Measure efficiency, reflected energy, and noise and harmonics at various RF intensities, intensity variations, and load conditions. Test panels should be large enough that edge effects do not dominate. 0103100029	500	$250K	0111003029	1.1:1 1 3:1 1 4:2 1.7:0.5 3 3:1 3.2:1 3.4:1 3.5:1 4.1.1 4.2:1 4 7:0.5
	SYS STUDY				3) Asses. results in systems studies and select design approaches for engineering and productibility development 0111003019	750	0111003029		1.1:2 1.4:3 3.2:1 1.3:2 3.1:1 2.1:2
	SYS STUDY	ASSESS & COMPARE POWER TRANSMISSION TECHNOLOGY			0111003029	60	0111503019		Same as 0111003019
	MILESTONE				0111503019	0			

D180-25381-1

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SPS SPS STUDIES	STRUCTURE, CONTROL, & THERMAL DYNAMICS 010401	Will active damping be a necessary or desirable part of the SPS attitude and configuration control scheme? If so, how can active damping be safely applied, considering the inaccuracies of modeling and the risk of exciting unmodeled or poorly modeled modes?	SPS structures will presumably have very little dissipative damping and will have very low-frequency modes. The time required for oscillations to decay may be so long that undesirable or hazardous oscillations may be a problem unless actively damped.	All SPS's	Develop detailed, integrated structural and control dynamics models including forcing functions such as gravity gradient, attitude control, and thermal cycling. Apply various types and degrees of passive and active damping and mode suppression. Introduce variations into the model representative of modeling errors and assess system stability. Assess need for active damping 010401017	500	-	010307018 SS 200 010401027 011104018 SS 250	1.1 2 1.7 1 3.1.0.5 3.2.0 5 1.2:2 10.1:0.01
		Can advanced control technology be applied to permit use of more flexibly (and therefore possibly lighter and cheaper) structures than represented in the current baseline?	Mass and cost savings, if structure cost savings exceed control costs.	All SPS's	Develop models as for previous task, but for very lightweight flexible structures. Assess stability and controllability. 010401027	400		011104018	Same as Above

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SPS STRUCTURES	STRUCTURAL DESIGN 010402	What structural design approaches are best suited to the various SPS requirements? How are these influenced by considerations of precision loads, stiffness, mass, cost, thermal environment, constructability, packaging, materials selection, and life? What are the appropriate design techniques and allowables?	Additional structural design and analysis is needed to ensure that structural options, requirements, and issues are defined to the degree necessary for structural dynamics and materials technology tasks.	All SPS's	1) Perform structural design and analysis tradeoffs in greater detail than thus far accomplished. 011104028	250	-	010402018 SS200 010405017 SS200 011104018	1.1:2 2.1:1 3.1:1 3.2:0.5
					2) Fabricate representative test parts to develop allowables data 010402018	300	$50K	011104018 010403018 SS50	1.1:1 3.1:0.5 3.2:0.2 3.4:0.5 4.1:1
	JOINTS & FASTENERS 010403	What structural joining & fastener techniques are appropriate to SPS, considering all the requirements and constraints? Can fasteners be designed to avoid joint slop? How can joint integrity best be determined or assured?	Joints are the most important part of a structural design. Joint slop if significant will greatly complicate structure and control dynamics. The integrity of the structure must be verified during or after fabrication in space.	All SPS's.	Design, analyze, fabricate and test alternative joint & fastener technologies and means of verification. Cover applications to main structure, solar array support, and MPTS structure. Evaluate and select best approaches 010403018	450	$25K	011104018 010405017 SS200	1.1:2 3.1:1 3.2:0.5 3.4:1 4.1:2

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SPS RESEARCH PLANNING DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
SPS STRUCTURES	THERMAL PROTECTION & CONTROL 010404	How can structural elements best be provided thermal protection and control, especially in high thermal loading areas? Can selective foil wrapping and/or thermal control coat [illegible] cause the structure to run cooler than the predominant thermal environment, e.g., to allow use of composites in hot areas? How can we minimize sunglint from thermal control surfaces?	The SPS designs involve severe thermal environments, e.g., in the power transmitter. In these same areas, use of composite materials such as graphite is highly desirable, yet such materials are not compatible with severe thermal environments.	All SPS's but particularly important for those employing high-power microwave links, e.g., above 3-4GH.	Conduct design, analysis, and detailed modeling of protection/control methods. Fabricate test articles for promising approaches test in representative SPS thermal environments and evaluate. 010404016	500	$10K	011105018	1.1:2 3.1:0.5 1.6:0.5 3.4:1 4.1:1
	HARDWARE PRODUCTION 010405	What production processes can be used to produce SPS structural elements , or space beam fabricator prepared stock, with the required precision at low cost? This question particularly applies to automated layup, etc., of composites.	Low-cost production of large space structures is an important element of achievement of SPS economics goals. Some of the SPS structures will require high precision.	All SPS's	Analyze production processes and relate processes to achievability of cost and precision goals. Conduct exploratory tests of promising production techniques. 010405017	500K	$20K	011104018	1.1:1 1.4:0.5 1.8:2 3.1:1 3.2:1 3.4:2 4.8:2
				Assess					
				Select	011104018	60		011504018	1.1:1 2.1:2 3.2:0.5 2.5:1
				Select	011504018	0			

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MATERIALS & PROCESSES (0105)	CRITICAL MATERIALS (010501)	What materials applications are critical? In those applications, what candidate materials offer potential of adequate life in the applicable environment? How can materials be protected (e.g., by metal plating or foil wrapping of composites to protect from U.V.)? Can we find materials that don't need coatings? How can we improve accelerated life testing of materials to provide assurance of very long (>50 years) life in a reasonable test period?	SPS's need long life to achieve favorable economics. Further, even though book life (writeoff period) may be 30 years, actual service life should be longer, up to 50 to 100 years, to further enhance economics and minimize problems of ultimate disposal of worn-out plants.	All SPS's	1) Survey materials *usage versus* environment and application 2) Select candidate materials 010501018	200	-	010501038 011105028	1.1:1 1.5:1 2.1:1
					3) Develop life-testing methods, including new approaches such as Paul Lindenmeyer's thermodynamic approach. 010501028	300	$10K	010501038 SS150	1.1:1 10.2:0.2 1.5:1 4.1:0.5 3.4:1
					4) Life-test materials and protection methods. 010501038	1000	$50K	011105018 FS-200	Coordinate with Task 010201018 1.1:1 4.1:0.5 10.2:2 1.5:2 3.4:2
					5) Set allowables and other design parameters as appropriate. 011105018	100	-	011505018	1.1:2 2.1:1 2.5:1

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MATERIALS & PROCESSES	HIGH TEMPERATURE COMPOSITES	What composites (especially low-CTE composites) are best suited to SPS applications in high temperature areas, e.g., the MPS or thermal radiator systems? What can be done to enhance life? Are there applicable metal-matrix (e.g., graphite-aluminum; sapphite or silica-reinforced aluminum) technologies?	Some of the SPS systems are thermally stressed, e.g., the baseline power transmission antenna; optics and heat rejection systems for lasers. Thermally hot areas may need good dimensional stability. Some of these needs are significant challenges to the composites technologies.	All SPS's	Test high-temperature composites in appropriate thermal environments. Develop / Test new materials systems as available and appropriate. Evaluate particulates and outgassing problems (see following task area). Conduct evaluation tests of metal matrix systems. Evaluate and select promising materials systems. Part of 011102028	700	$100K	011105028	2 parallel efforts 1.1:2 1.3:2 1.4:1 1.5:1 1.6:1 3.1:1 3.2:1 3.4:2 3.5:2 4.1:1 4.2:1 4.5:1 10.2:2 Total for 2
MATERIALS & PROCESSES	OUTGASSING & PARTICULATES	Can emission of gases, vapors, and particulates as a result of the combined vacuum, thermal, plasma, UV and radiation environments, be controlled to the degree necessary for successful operation of high voltage and microwave systems? What constraints are placed on materials selection and system design?	Outgassing and particulates emission could cause chronic, unacceptable problems with high-voltage or microwave system operation.	All SPS's (may be of secondary importance for solar-pumped laser SPS's).	Test and evaluate, in conjunction with previously noted M&P tasks, particulates and gas/vapor emission. Assess by test in conjunction with stressed insulators and microwave/laser devices, problem severity. Select and evaluate materials and system design approaches that can minimize this problem area. 010502019				

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MATERIALS & PROCESSES	MICROWAVE WAVEGUIDE & LARGE OPTICS SUBSTRATE MATERIALS	What materials options provide the combination of low coefficient of thermal expansion (CTE), high surface conductivity and long life at high microwave power under thermal cycling conditions, appropriate to SPS microwave waveguide applications? Are there analogous questions as to laser optics substrates? What materials are applicable?	Low-CTE is essential to high efficiency for the baseline microwave distribution and radiation system. Materials needs for long operating life optics systems are less explored (vis-a-vis SPS) but may involve similar needs.	Mainly basline SPS's but also may apply to solid-state and laser options.	Develop, test and evaluate candidate approaches such as plated or foil-coated composites, metal-impregnated composites; metal matrix composites; low-CTE metals. 010503018	350	20K	011105028	1.1:1 4.1:0.5 1.4:1 3.4:0.5 1.5:0.5 3.5:0.5 3.1:0.5 3.2:0.5
					Analyze optics requirements and conduct appropriate materials developments and tests. 010503027	350	10K	011105028	1.6:1 4.5:0.5 1.5:1 3.4:0.5 3.1:0.5 3.2:0.5
					Assess and select materials 011105028 011505018	200 0	--	011505018	1.1:1 3.2:0.5 2.1:1 2.5:1

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FLIGHT CONTROLS & SYSTEM CONTR	THEORY & SOFTWARE 01060	What mathematical approach is best suited to flight control of large flexible space structures? Are adaptive algorithms, e.g., that sense actual modes, possible or practical? What software design approaches are best considering the realities of projected sensing, computing, and actuation technologies? How can the software be validated?	Structural and control frequencies will not be as far separated as one might wish; they may even overlap. Active damping of structural dynamics may be required. Control system and software operation must be validated by simulation ---full-scale ground tests are not possible.	All SPS's	Review applicable research and technology in structure and control dynamics. Develop appropriate extensions and advancements in theory. 010601017	500	---	010601027 010602017 SS 200	1.2:2 1.7:0.5 3.1:1 3.2:0.3
					Develop software and systems architecture approaches; simulate as appropriate. Develop software validation concepts and approaches. 010601027	700	---	011106028 SS 200	1.2:1 1.7:3 3.3:0.1 10.1:0.02
FLIGHT CONTROLS & SYSTEM CONTROL	SENSING 010602	What sensor performance can be achieved consistent with long life? What kinds of gyros, star sensors, etc., should be used? How should sensors be installed, e.g., on structure or on specially designed platforms?	Sensor performance may be critical to stable and reliable operation of the flight control system.	All SPS's	Analyze sensor requirements and assess sensor technology. 010602017	200	---	010602027 011106018 SS100	1.2:1 3.2:0.2 1.1:0.5 1.6:0.5
					Conduct critical experiments as necessary to define development approaches Analyze sensor installation factors. 010602027	500	10K	011106028 SS 250	1.2:1 1.1:1 3.1:1 4.2:1 3.5:1

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FLIGHT CONTROLS & SYSTEM CONTROL	ACTUATION 010603	Can large, e.g., 10,000 kg, CMG's be built with adequate efficiency and long life? Is bearing technology, for example, adequate?	CMG's are a prime candidate for antenna precision control. Torque requirements will dictate use of large CMG's.	All SPS's.	Analyze and Conceptually design large CMG's. 010603016	200	---	010603026	1.1:1 1.7:0.5 3.2:0.5 1.2:1 1.3:0.5 3.1:1 1.4:0.5
					Conduct wheel, motor, and bearing tests as appropriate to ensure precision attainability and life. 010603026	300	10K	011106028	1.1:1 4.1:1 1.2:1 4.2:1 3.4:1 3.5:1 3.1:1
		What mechanical (i.e., force or displacement) actuation technology should be used for these large systems? How can active damping actuation be implemented? Can electrostatic control be used for large thin-film reflectors?	Mechanical actuation is needed for antenna drives, adaptive optics, subarray allignment, and other functions.	All SPS's	Analyze electro-mechanical, electro-magnetic, piezo-electric, and electrostatic systems. Conduct feasibility tests as appropriate. 010603036	300		011106018 SS100	1.1:1 4.1:0.5 1.2:1 4.2:0.5 1.6:1 3.2:0.5 3.4:0.5 3.5:0.5
					Analyze Flight Controls Technology Applications to SPS systems. 011106018	200		011106028	2.1:1 1.2:1 2.2:1 2.5:1
					Assess Flight Controls Tech. 011106028	60		011506018	
					Select Flight Controls Tech. 011506018	0			

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SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LABS	RESOURCES
FLIGHT CONTROLS & SYSTEM CONTROL	DATA ACQUISITION & MANAGEMENT 010604	Can a low-cost microprocessor be developed to serve as a remote acquisition and command unit? Will it require radiation shielding?	Each SPS will likely require thousands of such devices. Their cost could be significant.	All SPS's	Develop preliminary hardware and software design for a standard microprocessor RACU. Analyze radiation sensitivity and determine shielding requirements. 010604017	200	---	010604027 SS 100	1.4:2 1.7:1 1.1:1 1.5:0.5 3.2:0.5
		Can the system be designed to incorporate fault-tolerant computers and software of high degree of onboard autonomy as regards fault detection, isolation, and correction?	Operations cost can be minimized by reducing operations personnel required for system monitoring and control, and for replace/repair maintenance.	All SPS's	Develop systems architecture and software design approach. Perform software simulations to assess practicality of approach; evaluate and update approach. 010604027	400	---	011106038	1.4:2 1.7:2 3.1:0.5 3.2:0.5 10.1:0.01
		Can data acquisition be designed to use electro-optical devices with fiber optic interconnection?	Fiber optics will minimize mass, cost, EMI susceptibility, and radiation sensitivity.	All SPS's	Design, fabricate, test, and evaluate electro-optical or optical instruments for measurement of voltage, current, temperature, strain position, and pressure. 010604037	300	10K	011106038	1.4:2 4.5:1 1.6:1 4.2:1 1.1:1 3.2:0.5 3.1:1 3.4:1 3.5:1
					Assess data acquisition and management technology. 011106038	200	---	011506028	2.1:1 2.5:1 3.2:1 1.4:1 1.7:1
					Select data acquisition and management technology. 011506028	0			

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SPACE CONSTRUCTION & MAINTENANCE	STRUCTURE FABRICATION 010701	What quality of structure can be made by beam machines (i.e., how straight, how strong, etc.)? How fast can they operate? Can they be used to make high-temperature composites? Can they accomplish secondary tasks such as installing hardpoints, wrapping with foil or other UV protection? How long will they last? How adaptable are they to various structural designs, e.g., closed sections?	Beam machines solve a major problem in the construction of very large space structures: packaging density. Their performance and technical features are critical to the integrity, mass, cost, and life of large space structures. The technology programs should ascertain where they can be used and where alternative methods must be employed.	All SPS's.	Continue beam machine technology. Analyze applicability to a variety of applications and to secondary tasks. Design, fabricate, and operate test machines to demonstrate key features and capabilities. 010701017	500	100K	020701017 011107016	Two Efforts 2.1:2 3.4:4 1.1:6 4.1:4 1.3:1 2.4:2 1.4:2 1.1:2 3.2:1
					Conduct a flight verification of operability of a test machine on a shuttle flight. 020701017	400	15E6	011107018	2.1:2 1.1:5 4.1:10 10.6:0.5 2.2:3 1.2:3 4.2:10 10.7:0.5 2.3:3 1.4:3 3.4:3 4.7:10 2.4:5 1.7:2 3.5:3 2.5:2 3.1:5 4.5:5 2.6:2 3.2:3 5.4:1 1.3:3
		What alternative (to beam machines) technologies are necessary or desirable to round out an adequate inventory of structure fabrication technologies? How do these relate to special problems such as high-precision or high-temperature composite structures? Special shapes, etc.?	A wide range of requirements exists for many types, shapes, etc. of structures. Beam machines will not likely be able to fulfill all requirements.	All SPS's	Derive a comprehensive set of structure design and operational requirements. 010701027	200	---	010701037	1.1:1 3.2:1 1.2:1 2.2:2
					Analyze, design, fabricate, test, and and evaluate candidate structure/fabrications solutions to those requirements, not best served by beam machines. 010701037	400	10K	011107018	1.1:3 2.1:1 1.7:0.5 3.1:1 3.2:0.5 3.4:1 4.1:1

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SPACE CONSTRUCTION & MAINTENANCE	MATERIALS & EQUIPMENT HANDLING 010702	How effective will manipulators be for construction and assembly tasks? How dextrous are they? What kinds of tasks can they perform? How fast can they work? What kinds of software or auto-pilot help can be provided to the operator? To what degree will the dynamics of assembly tasks be complicated by the dynamics of cherrypickers? What about operator viewing? Should the operator be at the unit or can he be remote?	Many assembly tasks have been identified that will require use of manipulators. The speed and effectiveness of their operation may be significant in setting overall construction pace and cost, and will certainly influence the design of construction operations as well as SPS hardware.	All SPS's	Develop simulations and tests using existing and/or breadboard/brass-board manipulators. Test representative assembly tasks with zero-g simulation. Investigate software/autopilot aids. Perform key tests on shuttle sortie if necessary. 010702017	500	$50K	011107018 010703017 SS250 010706017SS2*0 010707015 SS250 010709017 010709018 SS300	1.1:2 2.1:1 1.2:0.5 2.2:1 1.7:1 2.6:3 3.1:1 3.2:1 3.4:1 4.1:1 4.2:1 (Resource level assumes no shuttle flight)
	JOINT & ASSEMBLY INTEGRITY 010703	How can we best provide means of assurance of structural/mechanical or fluid joints made in a construction operation? What combination of SPS hardware design and construction operations procedures are appropriate?	SPS's cannot be assembled and tested on the ground. Accordingly, quality assurance procedures and design approaches are essential to the ability to successfully construct one of these large artifacts in space.	All SPS's.	Design, analyze, fabricate, and test integrity assurance devices and procedures. Coordinate with thermal systems and structures tasks, #'s 010204047 & 010403018 010703017	500	$10K	011107018	1.1:2 3.1:0.5 3.2:0.5 3.4:1 4.1:1 2.6:1

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SPACE CONSTRUCTION & MAINTENANCE	BERTHING & DOCKING 010704	Can large vehicles and/or facilities be docked or berthed to large space systems as SPS. Can large structures be berthed to one another? Can direct fly-together be used or will tethered or other indirect approaches be used? Will thruster plume impingement be a problem?	Docking or berthing will be necessary to enable vehicles to transfer payloads to facilities, to enable berthing of maintenance vehicles and/or facilities to SPS s and docking veh cles to construction bases.	All SPS's	Develop dynamic models for representative docking and berthing problems; analyze and evaluate. Prepare documentation of design requirements and constraints resulting from this analysis. 010704017	300	-	011107018 011104018	1.1:2 1.7:2 3.1:0.5 3.2:1 2.2:1
	SOLAR ARRAY DEPLOYMENT 010705	How can the deployment of large lightweight solar arrays best be accomplished with adequate control? Will accordion folds or rolls be best? What is the best way to package the arrays for launch and subsequent deployment? Would it be practical to have an array assembly machine that would assemble the array from panels and tapes as it is deployed?	Lightweight solar arrays will be fragile and may be difficult to handle and control, especially in the large SPS sizes. Safe, reasonably compact packaging for launch may be a problem. An array assembly machine could improve packaging and would allow a final check-out of each panel just before it is assembled into the array.	All Photovoltaic SPS's	Analyze alternative deployment methods, including dynamic mathematical simulations. Evaluate packaging methods. Fabricate and test candidate packaging and deployment schemes. Perform preliminary design of an array assembly machine. Select most promising deployment technology and test on shuttle flight. 0207C5017	500 010705018	$50K	011107018 020701017 (010101038- 010705018)	1.1:3 2.5:2 4.7:1 1.2:1 2.4:3 1.3:2 3.1:3 1.4:2 3.2:3 1.8:1 3.4:3 2.1:1 3.5:3 2.2:1 4.1:3 4.2:3
						400		15e6 011107018	Same as 020701017

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SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK. DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
SPACE CONSTRUCTION & MAINTENANCE	FLUIDS CHARGING 010706	Can a technique for charging SPS fluids systems be devised that will minimize leakage, contamination, and losses?	All SPS's will have fluid systems, e.g., stationkeeping propellant, thermal control coolants. On-orbit charging for construction, replenishment, or repair will be required.	All SPS	Develop design approaches; analyze, select, and fabricate promising candidates for test. 010706017	500	$10K	011107018	1.1:1.5 1.5:0.5 3.1:0.5 3.2:0.5 3.4:1 4.1:1
	REFLECTORS 010707	What design approaches and construction techniques can be used to successfully deploy large plastic film reflectors while maintaining adequate contour or flatness?	Many reflector applications, e.g., for photovoltaics, require maintenance of even illumination. At high concentration ratios, accurate contours are necessary to achieve intended performance.	SPS's employing optical concentration.	Perform design studies and analysis. Fabricate and test subscale examples as appropriate. Coordinate with concentrator task No.010202015. 010707015	500		010202015- 010707015 SS100 011107018	2.1:1 1.1:1 3.1:1 3.2:0.1 3.4:1 4.1:1
	CONDUCTORS 010708	What design approaches and construction techniques can be used to install power conductors? How can joint continuity be ensured?	Power conductors may be located in difficult-to-access locations. Conductor integrity is critical.	All SPS's	Design and analyze techniques; test subscale and evaluate quality of conductors. 010708018	500	$50K	011107018	1.1:1.5 2.1:1 3.4:1 1.3:1 2.6:1 3.5:1 1.5:0.5 3.1:1 4.7:2 1.8:0.5 3.2:0.5

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SPACE CONSTRUCTION & MAINTENANCE	SUBARRAYS, EQUIPMENT, & CABLING 010709	What design approaches and construction techniques can be used to install antenna subarrays and other equipment and cabling? What means is best to accomplish checkout, adjustment, and verification? How can equipment damage be avoided?		All SPS's	Design and analyze techniques, test full size or subscale as appropriate and evaluate results. 010709018	700	$50K	011107018	1.1:2 2.1:1 3.4:1 1.3:0.5 2.2:1 3.5:1 1.4:0.5 2.6:2 4.7:2 1.8.1 3.2:1 10.7:0.5

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SPACE CONSTRUCTION & MAINTENANCE	TRACKS & BASE MOBILITY 010710	How can mobility for equipment and crews be provided? What track designs are most practical and can be attached to or integrated with base structure? What track/wheel or other approaches can provide reliability, long service life, and light weight? How should crews be transferred, e.g., bus/airlock vs vacuum and suited? Is free-flying, e.g., by backpack an option?	Typical construction bases are several kilometers in extent. Equipment and crews must move freely about. Without an effective and safe crew transfer/mobility system, a large fraction of available working hours could be spent in shift change operations.	All SPS's	Analyze and design base mobility systems to sufficient depth to ensure understanding of design requirements and technical options. Fabricate and test, under appropriate thermal/vacuum conditions, promising mobility hardware approaches 010710017	500	$10K	011107018 010709017 SS250	2.1:1 1.1:2 1.3:1 1.8:0.5 3.1:0.5 3.2:0.5 4.1:0.5 10.6:0.2
	SIMULATORS 010711	What simulation capabilities will be required for procedure development and crew training? How much in-space training and development will be needed?	Simulators and training could be significant contributors to development and on-going costs.	All SPS's	Analyze and test key operations simulations. Evaluate simulation and training needs. 01071117	500	---	011107018	2.1:1 1.1:1 2.6:2 1.7:0.2 3.2:0.5
				Sys. Anal.	011107018 011507018	200 0		011507018	2.1:2 1.1:1 1.8:1 3.2:1

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SPACE TRANSPORTATION	MAIN PROPULSION 01C801	What can be done to improve engine life, reliability, and safety, particularly with respect to thrust chamber low cycle fatigue and turbopump bearings and seals?	Low transportation costs are predicated on engine life of 5-10 hours with infrequent major maintenance and high vehicle reliability with loss (attrition) rates of 0 % or less.	All SPS's.	Analyze and test key engine design improvements 010801017	500 (Note: This task is viewed as being conducted at the component technology level.)	$50K	011108018	1.1:3 3.1:1 4.1:3 3.4:2
		What is the best design for a new booster engine? Is methane fuel a good idea? What chamber pressure, cycle, and thrust should be used?	A booster engine in the F-1 thrust class is needed to provide a fully reusable low-cost booster. Fuel, cycle, etc., questions need to be decided.	All SPS's	Perform basic combustion and heat transfer tests on methane and other fuels as necessary to establish design data. 010801027	300	$10K	010801037 SS100 011108018	1.1:3 1.5:1 4.1:3 3.4:2
					Conduct Phase A engine study, coordinate with vehicle study. 010801037	200	-	011108018	2.1:1 1.1:3 2.2:1 1.4:1 2.5:1 3.2:1

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SPACE TRANSPOR-TATION	HLLV 010802	What size should the HLLV be? Can a size be selected that provides commonality with a liquid flyback booster for Shuttle? What technology level should it use? How large should the payload bay be? How does this affect payload packaging and space construction? What configuration, i.e., series or parallel burn? How will environmental impact alleviation influence the vehicle design? How can the vehicle be designed to minimize turn-around time?	The HLLV is a primary contributor to space transportation recurring and nonrecurring cost. This vehicle should be carefully cost-optimized and cost effective technology advancements should be employed. Turn-around is a key driver on fleet size and operations cost.	All SPS's	Perform HLLV design and operations study with sufficient depth to get into subsystems design, technology, payload packaging and integration and flight operations. Analyze subsystems and built-in diagnostic instrumentation and software to minimize turn-around and other ops costs. 010802017	250	-	010801037 SS100 011108018	2.1:2 2.2:1 2.5:1 1.1:3 1.2:1 1.3:0.5 1.4:1 3.1:1 3.2:2
		What is the best technical approach to providing a fully reusable LH_2 insulation?	Present-day launch vehicle LH_2 insulations are not fully reusable. A suitable technology is essential for an internally-tanked orbiter.	All SPS's	Design and test reusable insulation concepts including foam types, gas barrier systems, and titamium honeycomb. Evaluate for cost and producibility. 010802027	400	$20K	011108018	1.1:2 1.5:1 3.1:1 1.8:1 3.4:1 4.1:2

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SPACE TRANSPORTATION	HLLV	How can a fully reusable TPS be provided? Is the best approach to improve shuttle RSI or develop a new technology?	These are concerns regarding RSI durability and serviceability. Improved RSI, however, may be a more promising avenue than alternatives. The TPS for HLLV may be a cost and turn-around driver.	All SPS's	Design and test improved RSI approaches. Analyze and evaluate relative to alternatives, e.g., hot structure active cooling. Conduct tests of alternatives as appropriate. 010802037	500	$50K	011108018	1.1:2 1.5:1 3.1:0.5 3.4:1 4.1:1 4.5:1 2.1:1
	ELECTRIC PROPULSION	How can argon ion thrusters be improved for higher current, larger size, higher efficiency, lower mass, longer life, and less complex power processing?	Electric propulsion is needed for SPS attitude control and stationkeeping and offers substantial reductions in transportation cost to geosyrchronous orbit.	All SPS's	Perform design and analysis of improved ion thrusters. Test promising improvements. Develop design data and approach for SPS-class argon ion thruster. 010803017	600	$50K	011108018 010803027 SS100	1.2:2 4.1:1 1.3:1 4.2:1 1.4:1 4.5:1 1.6:1 3.1:1 3.4:1 3.5:1
		What is the potential of magnetoplasma-dynamic thrusters relative to ion engines?	MPD's may provide lower mass and cost and need less power processing. However, they are ill-understood at present.	All SPS's	Conduct exploratory research program (design, analysis, and test) on MPD thrusters. Evaluate relative to ion systems. 010803027	600	$30K	011108018	1.2:1 4.1:0.5 1.3:0.5 4.2:0.5 1.4:0.5 4.5:0.5 1.6:1 2.1:0.5 3.1:0.5 3.4:0.5 3.5:0.5
		How much will solar cells degrade during Van Allen belt transfer exposure?	Transfer exposures may accummulate up to 10X the dose expected for 30-year SPS on-orbit service.	All SPS's	Extend radiation tests (010101028 & 010102028) to high fluences. Analyze benefits of the other shields. 010803047	500	$250K	011108018	1 3:2 10.3:0.5 1.6:2 4.5:1 3.2:1 3.5:2

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SPACE TRANSPORTATION	ELECTRIC OR OTHER LOW-THRUST PROPULSION	What guidance, navigation and control algorithms should be used to fly an EPS vehicle, considering orbit raising, plane change, gravity gradients, occultations, seasonal and orbit geometry variations, destination targeting, thruster pointing restrictions, vehicle configurations, and vehicle flexible-body dynamics?	Algorithms suitable for flying large electric orbit transfer vehicles have not been developed. The partially-applicable solutions that exist are complicated, consume a lot of machine time, and do not consider thruster pointing restrictions or vehicle dynamics.	All SPS's	Conduct a comprehensive analysis, simulation, and algorithm development program. 010803037	600	-	011108018	1.2:2 2.1:1 1.7:2 10.1:0.02
	LASER PROPULSION	What is the best engine approach, CW or pulsed? What are the power level and cooling constraints for each in terms of Isp and thrust? What are the best propellants? How do orbit geometry and systems considerations influence the design and the potential attractiveness of a laser OTV.	Laser propulsion for orbit transfer offers the opportunity to separate the power source from the vehicle. Thus the power source, for example, could be at GEO and need not be exposed to intense Van Allen radiation; it needs to be transported only once. Additional thrust-to-weight level flexibility is also provided	All SPS's	Conduct feasibility tests of thruster concepts at adequate laser power levels (>100 KW). Evaluate and assess potential in system studies. 010804016	400 011808018	$100K	011108018	1.2:2 1.3:1 1.4:1 1.5:1 1.6:2 3.4:1 3.5:1 3.1:1 4.1:1 4.2:1 4.5:1

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SPACE TRANSPORTATION	SPACE BASING & PROPELLANT TRANSFER	How should vehicles, e.g., OTV's be designed to facilitate space basing? What service life can be attained? How should the vehicles be maintained and how designed for maintenance? What kinds of support will they need, e.g., what sort of bases? What components does it make sense to periodically return to Earth for service?	Space basing offers significant performance advantages and attendant cost savings and is, indeed, the only practical approach for large electric or laser OTV's.	All SPS's	Perform an integrated design and operations study of space basing. Develop design requirements for vehicles and subsystems. Conduct tests and evaluation of key or novel design features, e.g., subsystem remove/replace/checkout. 010805015	200	-	011108028	2.1:2 2.2:1 1.1:2 3.1:1 3.2:2 3.4:0.5 4.1:0.5 2.5:1 2.6:1
					Integrated Transp Analysis 011108018	350		011108028	Same as 010802017
					Tech Assess 011108028	60		011508018	Same as 010802017
					Milestone 011508018	0			
	LAUNCH OPERATIONS TECHNOLOGY	Is a sea-based launch site a practical low latitude option?	Sea-basing, if economically practical, offers significant advantages over low-latitude land-based sites.	All SPS's	Perform a detailed design and ops study, emphasizing design-to-cost. 010806017	350	-	011108018 010802017 SS 150	1.1:1 1.9:1 3.2:1 1.2:0.5 2.1:2 1.3:1 2.2:1 1.4:0.5 2.5:1 1.8:1 2.6:1 3.1:1

64

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POWER DISTRIBUTION & PROCESSING	SHEET CONDUCTORS 010901	Can thin, e.g., 1 mm sheet conductors be anodized or otherwise coated to provide good passive heat rejection at ≈ 100°? How can cracking of coatings due to differential expansion be avoided? How long will the coatings last? How must sheet conductors be supported to ensure that electro-static or electro-magnetic forces will not deform them excessively? How can they be joined during deployment in space? Can they sustain damage, e.g., from meteoroids?	Baseline SPS's employ aluminum sheet conductors for efficient operation, low mass, and passive heat rejection. Performance of heat rejection coatings is critical. Electromagnetic forces, especially during transients, may be a problem and need to be considered.	All SPS's using some form of electric power generation onboard	Fabricate samples of sheet conductors with coatings and test for performance and life. 010901017	500	$10K	011109018	1.1:1 3.4:1 1.3:1 1.5:1 3.1:1
					Analyze forces and support requirements. Test large section under e/m transient forces to confirm load predictions. 010901028	300	$40K	011109018	1.3:1 1.1:2 1.5:1 3.4:1 3.5:1 4.1:1
	TRANSIENTS ANALYSIS 01 02	What effects will be caused by travelling waves in the power distribution system as a result of fault currents? What effects will be caused by startup and shutdown?	Magnetic forces, electromagnetic impulses, and over-voltage and reverse bias damage to system components are potential effects. Major damage to an SPS is a possibility if the design does not include features that will limit these effects.	All SPS's using onboard electric power generation.	Develop detailed transient analytic models. Analyze fault currents and traveling waves. Analyze normal and emergency startup and shutdown transients. Assess structural requirements and insulation requirements; determine impact on design features, mass, and cost. 010902018	500		010901028	1.1:1 1.3:3 1.6:1 1.7:2 2.1:1 2.5:1

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POWER DISTRIBUTION & PROCESSING	INSULATORS & STANDOFFS	How should high-voltage insulators be designed? What standoff distances are needed? What are the critical uses of insulation? What materials should be used? How can the effects of particulates and vapor (outgassing) emission be minimized? Can contaminated insulators be cleaned and refurbished?	High voltage breakdown can lead to damage (see previous sheet on transients) and if it recurs, could force system shutdown until repairs are made. This would adversely affect plant availability and power cost.	All SPS's using high voltage power distribution	Perform design and analysis studies on high voltage insulators and standoffs. Conduct tests of promising designs in appropriate thermal/ vacuum environment, including particulate and outgassing conditions. Evaluate and define appropriate SPS design requirements. 010903018	350	$10K	011109018	1.1:1 1.3:2 1.5:1 3.4:1 4.1:1 4.2:1 10.2:0.5
	INSULATION MATERIALS	What materials can be used that will provide long life and flexibility in the thermal/ vacuum/UV/radiation environment?	Terminal distribution, e.g., to RF power amplifiers, and other interconnects, will need to use insulated cabling.	All SPS's using high voltage power distribution	Conduct literature search to identify promising materials. Analyze and test for life and suitability in appropriate environment. 010904018	700	$10K	011109018 010903018 SS100 011105028	1.1:1 1.3:0.5 1.5.0.5 3.4:0.5 3.5:0.5 4.2:0.5 10.2:0.5

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POWER DISTRIBUTION & PROCESSING	PROCESSORS & PROCESSING	What is the best way to achieve lightweight and long life in high voltage, high power transformers?	Power processing equipment represents a significant (≈10%) fraction of the mass of some SPS systems. Long life is a problem.	All SPS's using high voltage distribution	Perform design study for light-weight, long-life transformers, especially liquid-cooled. 010905018	200	-	010905038 SS100 010905028	1.1:1 3.2:0.5 1.3:2 1.4:0.5 3.1:0.5
					Evaluate ant test high-performance magnetics and materials. Construct test articles, and test for life, efficiency and breakdown. 010905028	450	$10K	011109018	1.1:1 3.4:1 1.3:1 3.5:1 3.1:1 4.2:1
		Can integrated synthesizer/transformer and transformers-rectifier designs be developed that allow transformers and cooling systems to be used to shield sensitive high-voltage solid-state components?	High-PIV solid-state components are highly sensitive to radiation damage.	All SPS's using high voltage distribution	Perform subsystem design study of power processors. Include a detailed radiation dose/shielding/damage analysis. 010905038	200	-	010905048 SS100 011109018	Same as 010905018 + 1.6:0.5
	SPLIT PROCESSORS	What performance can be achieved with split processing and AC power distribution? What frequencies should be used? How well can this technique adapt to supplying low voltages for solid state amplifiers?	Split processing would enable use of lower voltage solar arrays and would remove much of the equipment from the transmitter. It would facilitate final processing to the low voltages that may be needed for solid-state systems.	All SPS's using electric power distribution.	Conduct a design study of a split processing system for 2 or 3 representative SPS designs. Assess efficiency, mass, EMi, and radiative losses to select frequency. 010905048	200	-	011109018	Same as 010905018

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POWER DISTRIBUTION & PROCESSING	BREAKERS & INTERRUPTERS	What performance, especially fast response, can be achieved with hvdc circuit breakers? How reliable can they be? What type (vacuum, plasma, mechanical) should be used?	Fast and reliable power cutoff is essential to minimize damage from RF arcs and power supply or distribution faults.	All SPS's using elec. ac power distribution.	Conduct a design and analysis study of circuit breakers 010906018	200	-	010906028	Same as 010905038
					Fabricate and test promising designs. Include zero-g tests (drop tower, KC-135, or Shuttle) as appropriate. 010906028	400	100K	011109018	1.1:2 4.1:2 2.4:2 1.3:4 4.2:4 2.5:1 1.4:1 3.4:2 1.6:0.5 2.5:2 3.1:1 2.1:1
	EMI EFFECTS	Will power processing and distribution lead to EMI effects? In particular, will the switching frequency ripply modulate the power beam? If so, can some form of localized filtering or processing of sensitive supplies mitigate this effect?	EMI on the power beam could exacerbate RFI problems. EMI on other subsystems could interfere with control, data acquisition, commands, or communication	All SPS's using power distribution.	Conduct detailed simulation analyses to assess EMI problems. Modify power distribution and other configuration features as necessary to get acceptable levels of EMI 010907018	400	-	011109028	1.3:2 1.4:2 1.7:2 3.1:1 3.2:1
					PD&P Design 011109018	250		011109028	1.1:2 1.4:1 3.2:1 1.3:2 3.1:1 2.1:2 2.2:1 2.5:1
					Tech. Assess 011109028	60		011509018	Same as 011109018
					Decision 011509018	0			

NOTES

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SPS RESEARCH PLANNING DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
	SLIP RINGS	What slip ring and brush designs will provide adequate (>30 year) life? Will there be problems with wear particles tracking h.v. insulators?	The slip ring is a potential single-point failure item.	All SPS's using slip rings for power transfer.	Test slip ring brush systems for life in a simulated vacuum and high voltage environment. 0109*8018	800	20000	0111090181	Same as 010903018

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SPS RESEARCH PLANNING DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
SPACE ENVIRONMENT & PLASMA EFFECTS (CY01)	SPACECRAFT CHARGING	How will spacecraft charging at geosynchronous orbit affect a large-area spacecraft such as an SPS? Will currents be imposed on the power distribution system? What design approaches can be used to avoid EMI and breakdown? Will the currents and electrostatic or magnetic fields distributed over the SPS introduce new charging effects?	Spacecraft charging and resulting effects has produced significant problems for some geosynchronous spacecraft. SPS's may result in new or unexpected effects due to size, high voltage, and high currents.	All SPS's	Conduct a review study and analytical simulation to predict effects. Conduct chamber and flight tests (e.g., shuttle sortie, test s/c at GEO) as as necessary to augment existing and projected data base on this subject to include SPS-peculiar problems.	Review & Anal 011001019 500	-	011001029	2.1:1 3.2:1 1.3:0.5 1.6:2 1.7:1
						Chamber 011001029 200	$10K	021001019	1.1: 3.1:1 4.1:1 1.3:1 3.4.1 4.2:1 1.6:1 3.5:1 10.3:0.5
						Sortie 021001010 300	$25 Million	011110019 021002019 SS30 021004019 SS30	2.1:2 1.1:3 4.1:2 4.7:3 2.2:3 1.4:2 4.2:5 2.3:3 1.3:3 3.4:3 2.4:3 1.6:2 3.5:? 2.5:2 1.7:1 4.5:1 2.6:1 3.1:5 5.4:10 3.2:3
	HIGH VOLTAGE BREAKDOWN	Can solar arrays be operated at high voltages? What can be done to eliminate breakdown due to plasma and space charge effects? Will these effects influence the power distribution or transmitter systems?	Breakdown effects may limit solar array and/or power distribution voltages. If so, the array/ power distribution design will have to be re-throught.	All SPS's using high voltage electric power.	Conduct a review and analysis study. Perform chamber and flight tests to discover/ confirm effects. Evaluate results in systems studies and modify reference designs accordingly (if necessary). 021002019	300	Piggy back on 021001019	011110019	Same as 021001019

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SPS RESEARCH PLANNING DETAILED WORKSHEET

[illegible]	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
[illegible]	MAGNETIC TORQUES	Will SPS currents lead to significant attitude torques? Can these be put to constructive use?	Torque effects have not been assessed. Some spacecraft use magnetic torqueing for attitude control.	All SPS's using electric power.	Conduct a study and analysis of magnetic fields and torque effects 011003018	300	-	011110019	Same as 011001019
	ELECTRIC THRUSTER PLASMAS	Will plasmas from electric thrusters provide a significant leakage path for SPS electric power, or will they cause other problems?	Thruster plasmas could cause significant power loss through plasma currents.	All SPSs using electric power and electric propulsion	Conduct a detailed plasma effects simulation analysis. 011004019	300	-	021004019 011004029	Same as 011001019
					Perform a flight test with an electric thruster on a Shuttle sortie. 021004019	300	Piggyback on 021001019	011110019	Same as 021001019
		What effects will electric propulsion plasmas have on the geomagnetosphere and trapped radiation belts?	Preliminary studies suggest significant effects: geomagnetic waves, trapping of plasma. Weather effects are not out of the question.	All SPS's using electric propulsion, especially for orbit transfer.	Conduct a thorough analytical study. Integrate test activities with above task. 011004029	750	-	011110019	Same as 011001019
					011110019 Anal	200	-	011110029	Same as 011001019
					Assess 011110029	60		011510019	
					Milestone	0			

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D180-25381-1

SPS RESEARCH PLANNING DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK NO.	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
01 GBED	11 SYSTEM STUDIES	How well is silicon solar array technology suited for SPS?	Assessment is required to select best array technology.	All photovoltaic SPS's	Review research results, assess mass, cost, degradation, annealing effects, array fabricability 011101018	60	-	011501018	1.3:1 2.1:2 2.2:1 2.3:1
		How well is gallium arsenide solar array technology suited for SPS?	Assessment is required to select best array technology.	All photovoltaic SPS's	Review research results; assess mass, cost, degradation, annealing effects, gallium production and array fabricability. 011101028	60	-	011501018 011509018	Same as 011101018
		Are any of the alternate photovoltaic technologies ready for SPS development? What benefits do they provide?	Assessment is required to determine whether alternate technologies should move into development or continue in research.	All photovoltaic SPS's	Review research results: assess mass, cost, degradation, technical uncertainty, production, and fabricability. 011101038	60	-	111501018	Same as 011101018

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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01 GBED	11 SYSTEMS STUDIES	Can existing thermal engine SPS designs be improved to make thermal engine thechnology more attractive for SPS use?	If so,it would improve the benefit of thermal engine options as a "lid" on photovoltaics costs. Also would benefit laser options using thermal engine technology.	SPS's in general.	Review thermal SPS designs, especially concentrator and radiator technology Review Brayton/ Rankin/Cascade trade. 011102015	300	-	011102028	1.1:1 1.7:1 2.1:1 3.1:1 3.2:0.5 10.1:0.01
		Should the thermal engine option be continued into next phase?	Affects planning and designs for subsystem and process engineering developments.	SPS's in general	Review thermal engine design studies and technology; assess costs and benefits. 011102028	100		011102038	Same as 011102015
		What thermal and fluid systems development activity should be conducted in the next phase?	Affects planning and designs.	SPS's in general	Review and assess thermal/fluid technology status. Make final development recommendations. 011102038	150		011502018 011502028	Same as 011102015

D180-25381-1

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01 GBED	11 SYSTEMS STUDIES	What guidance should given to the MPTS technology program? What do the evolving technology results mean in terms of efficiency, mass, cost, noise and harmonics, and life?	The integrated performance of MPTS technology is critical to overall SPS assessment.	All Microwave SPS's.	Maintain continuing review and assessment of microwave technology. Provide guidance; reflect research results in updates of reference microwave systems. 011103019	750		011103029 FS-50	1.1:2 1.3:2 1.4:3 2.1:2 3.1:1 3.2:1
		What microwave and laser technologies should be carried forward into development?	Assessment is required to select best technologies	All SPS's	Review research and systems study results; assess mass, cost, performance, RFI, life, reliability, and maintainability 011103029	60	-	011503019	Same as 011103019
		What is the best integrated MPTS systems design?	MPTS design sets design point for entire SPS.	All Microwave SPS's.	Conduct integrated tradeoff analysis of MPTS efficiency, mass, reliability, power level, and cost. 011103028	200	-	011103019	1.4:3 1.7:1 2.1:2 2.2:2 3.1:1 3.2:0.5

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01 GBED	11 SYSTEMS STUDIES	What structural designs, including details of joints and fasteners, are best for SPS?	Better structural definition needed for space construction and system dynamics research.	All SPS's	Perform detailed structural design tradeoffs and select design approach; develop design details as needed. 011104028	250	-	010402018 SS 200 010405017 SS 200 011104018	1.1:2 2.1:1 3.1:1 3.2:0.5
		What structures technologies should be carried forward into development?	Assessment is needed to select best technologies.	All SPS's	Review research and systems study results, assess mass, cost, constructability; dynamics predictability; life. 011104018	60	-	011504018	1.1:1 2.1:2 2.5:1 3.2.0.5
		What is the best mechanical/electrical rotary joint design? How does this vary with configuration, e.g., power level, solid-state vs tube? How do constructability and dynamics influence the design?	This design is a significant factor in establishing overall configuration as well as in construction engineering and packaging.	All SPS's	Design, analyze, and evaluate alternative mechanical/electrical rotary joint configurations 011104038	200	-		1.1:2 2.1:2 3.1:1

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01 GBED	11 SYSTEMS STUDIES	What materials technologies are best suited for SPS use.	Materials are critical to life and performance of structures and systems.	All SPS's	Review research results; assess life, cost, influence on system/ subsystem design 011105028	200	-	011505018	1.1:1 2.1:1 2.5:1 3.2:0.5
		What are the design allowables and other materials-related design criteria that should be used for SPS.	These will affect designs and hence mass, cost, and performance.	All SPS's	Review materials, structures, and subsystems technology and designs; set criteria 011105018	100	-	011505018	1.1:2 2.1:1 2.5:1

0180-25381-1

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SPS RESEARCH PLAN — DETAILED WORKSHEET

SUBPROGRAM	SUBJECT	KEY QUESTIONS	IMPLICATIONS	APPLICABILITY	TASKS & NETWORK #	DURATION (WORK DAYS)	NON-RESOURCE COST	TASKS FED & LAGS	RESOURCES
01 GBED	11 SYSTEMS STUDIES	What flight controls technologies should be carried forward into development?	Assessment is necessary to select best technologies.	All SPS's	Review research & systems study results: stability, controllability, dynamics suppression, mass, cost, complexity, configuration effects, and reliability. Set design criteria and select technologies. 011106028	60		011506018	Same as 011106018 (next page)
		What data management technologies, and software and hardware architectures are best suited to SPS? Are there configuration considerations?	Review and assessment is necessary to select best techoologies.	All SPS's	Review research & systems study results: mass, cost, complexity, risk of software validation, failure tolerance and system life. Select best approaches and technologies. 011106038	200	-	011506028	1.4:1 1.7:1 2.1:1 2.5:1 3.2:1
		How well will the developing flight controls, data, and structures technologies work together to control an SPS?	Integrated understanding of dynamics and control are essential to SPS success. Verification of actual system stability and controllability must be by simulation & analysis.	All SPS's	Integrate structures dynamics and controls analysis with configuration options. Perform an integrated dynamics simulation and assessment.	350	-	011106028	.1:2 1.2:2 1.4:2 1.7:2 2.1:1 3.1:2 3.2:1

D180-25381-1

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SPS RESEARCH PLANNING DETAILED WORKSHEET

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01 GBED	11 SYSTEM STUDIES	What is the most economical overall integraged space transportation system (and evolution thereof) for SPS? What size and performance should each of the vehicles have? How do they interface among themselves and with other operational elements?	Space transportation is expected to be the most costly operational element of SPS. Savings in this area will have high economic leverage.	All SPS's	Conduct an integrated, in-depth space transportation analysis and definition, taking into account the developing research and SPS systems study results. 011108018	350	-	011108028	1.1:3 1.2:1 1.3:0.5 1.4:1 2.1:2 2.2:1 2.5:1 3.1:1 3.2:2
		What space transportation developments should be pursued in the SPS development phase? What is the timing for others?	Space transportation systems are inherently long-lead schedule items.	All SPS's	Review and assess space transportation systems research and study results and future needs. Recommend development actions. 011108028	60		011508018	Same ss 011108018
		What is the best implementation of the developing flight controls technologies to the SPS systems?	The relationships of flight controls and systems dynamics are primary design and cost drivers.	All SPS's	Review configurations and detailed dynamics and controls research developed under other tasks. Conduct an integrated systems review. Provide system design guidelines and criteria 011106018	200	-	011106028	1.2:1 2.1:1 2.2:1 2.5:1

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01 GBED	11 SYSTEMS STUDIES	What is the preferred overall systems approach to SPS construction, including all supporting needs such as warehousing logistics, command and control, data management, etc. What specific development problems exist that should be resolved by the development phase.	A complete and detailed review is essential to final planning for the development phase.	All SPS's	Conduct integrated review, analysis, and assessment of all SPS construction technology and study work. Recommend development phase activities to resolve problems. 011107018	200	-	011507018	1.1:1 1.8:1 2.1:2 3.2:1
		What are the overall integrated operations required, including details not covered in earlier studies such as secondary equipment installation; SPS configuration control, quality assurance, and incremental checkout?	Detailed analysis and definition is essential to understanding total costs, problem areas, and development needs.	All SPS's	Conduct an in-depth integrated construction ops. analysis with simulations as appropriate. 011107028	350	-	011107018	1.1:2 1.8:1 2.1:2 2.2:1 2.6:2 3.1:1 3.2:2
		What should the power distribution and processing detailed design be, taking into account all relevant research and systems study work? (e.g., hv solar arrays, plasma effects, transients, power transmitter needs)	Power transmission system must respond to a wide variety of interface and environmental constraints. Design update is needed to select technologies and guide development.	All SPS's	Conduct a detailed, integrated analysis and design study. 011109018	250	-	011109028	1.1:2 1.3:2 1.4:1 2.1:2 2.2:1 2.5:1 3.1:1 3.2:1

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01 GBED	11 SYSTEMS STUDIES	What power distribution and processing technologies should be carried into the next phase? What development activities are needed?	Assessment is required to select best technologies and plan developments.	All SPS's	Review research & systems study results. assess mass, cost, life, controllability; damage limitation capability; maintainability and repairability. 011109028	60	-	011509018	Same as 011109018
		How will transient effects influence power distribution and processing design? What is necessary to avoid serious transient problems?	The SPS is a high power, high voltage, lightweight system. Transients are a potential critical problem.	All SPS's	Conduct a detailed, integrated transients analysis and simulation. 011109038	300	-	011109018	1.3:2 2.1:1 1.6:1 3.1:1 1.7:2 3.2:1
		What design modifications and features must be adopted to accommodate space environment effects (such as spacecraft charging)?	Space environment effects could be destructive to SPS's if the proper design features are not adopted.	All SPS's	Review research and analysis on space environment effects. Integrate these into design modifications and design criteria. 01110019	200	-	011110029	1.3:0.5 1.6:2 1.7:1 2.1:1 3.2:1

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0₂ GBED	11 SYSTEM STUDIES	How [illegible] are the changes required by space environment effects? What specific development activities are needed?	Assessment is needed to finalize plans for next phase.	All SPS's	Conduct review and assessment. evaluate impact on SPS mass, cost, reliability, availability. Recommend development effort. 011110029	200		011510019	Same as 011110019
		How are the overall integrated research and analysis results reflected in SPS reference design improvements or changes?	An integrated reference design is necessary to provide a basis for SPS mass, cost, and economics assessment.	All SPS's	Maintain cognizance of all SPS research and analysis; periodically update reference systems. 011111018	1400		011111038 SS 100	1.1:2 3.1:1 1.3:0.5 3.2:1 1.4:2 2.1:2 2.2:2 2.5:2

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DD design [illegible]
E designs [illegible] rity, 0-9 with 9 highest.

	ACTIVITY NUMBER(S)	DESCRIPTION	DURATION	A CODE	B CODE	C CODE	ESTD COST ($)
M	10100000	SOLAR ARRAY TECHNOLOGY: START	0	10100000	0	0	0
M	10101000	SILICON ARRAYS: START	0	10101000	0	0	0
	10101018	DEVELOP BASIC CELL DESIGN & PROCESS	750	10101018	0	0	5398000
	10101028	CONDUCT RADIATION EFFECTS AND ANNEALING TESTS	500	10101028	0	0	4310000
	10101038	DEVELOP ENCAPSULATION TECHNIQUES	750	10101038	0	0	6034000
	10101048	RADIATION & ANNEAL TEST GLASSED PANELS	300	10101048	0	0	2536000
	10101058	TEST & EVALUATE CELL/BLKT PROD PROCESSES	750	10101058	0	0	8298000
	10101068	TEST & EVALUATE SAMPLE PRODUCTION PANELS	150	10101068	0	0	266000
M	10102000	GALLIUM ARSENIDE: START	0	10102000	0	0	0
	10102018	TEST CELL FAB & SUBSTRATE TECHNIQUES	850	10102018	0	0	6084400
	10102028	RADIATION & ANNEAL TEST GAAS CELLS	500	10102028	0	0	4310000
	10102038	TEST & EVALUATE ENCAPSULATION TECHNIQUES	750	10102038	0	0	6034000
	10102048	RADIATION & ANNEAL TEST SAMPLE PANELS	300	10102048	0	0	2536000
	10102058	TEST & EVALUATE CELL/BLKT PROD PROCESSES	750	10102058	0	0	8298000
	10102068	TEST & EVALUATE SAMPLE PRODUCTION PANELS	150	10102068	0	0	266000
	10102078	TEST & DEMONSTRATE GALLIUM RECOVERY	400	10102078	0	0	1312400
	10103018	RESEARCH ALTERNATE P/V TECHNOLOGIES	750	10103018	0	0	2874000
	10103028	EXPLORE ARRAY FAB PROCESSES FOR ALTS	750	10103028	0	0	4874000
	10104018	CONDUCT CHAMBER PLASMA TESTS ON CANDIDATE ARRAYS	300	10104018	0	0	817600
	10104028	DEVELOP MITIGATING DESIGN OPTIONS AS REQD	150	10104028	0	0	175200
M	10201000	THERMAL SYSTEMS - START	0	10201000	0	0	0
	10201018	LONG-DUR THERMAL CONTROL COAT TESTS	1250	10201018	0	0	1515000
	10202015	NEW/NOVEL SUN CONCENTRATOR DESIGNS	200	10202015	0	0	179600
M	10203000	THERMAL ENGINES - START	0	10203000	0	0	0
	10203015	CERAMIC TURBINE & HTX DEV & TEST	750	10203015	0	0	1800800
	10204017	FLUID SYS & JOINTS METEOROID PROT TESTS	450	10204017	0	0	1173200
	10204027	HEAT PIPE TECHNOLOGY DEVELOPMENT	500	10204027	0	0	442000
	10204037	CIRCULATING THERMAL CONTROL DEVEL	500	10204037	0	0	442000
	10204047	SPACE REPAIR OF FLUID SYS TECHNOLOGY	300	10204047	0	0	734000
	10204057	ZERO-G HEAT TRANSFER	400	10204057	0	0	936400
	10204067	DEVEL INTEGRATED RADIATOR TECHNOLOGY	400	10204067	0	0	936400
	10204078	DEVEL SPACE LIQUID METAL CONTAIN TECHNOLOGY	700	10204078	0	0	803200
	10204088	DEVELOP RADIATOR PRODUCTION TECHNOLOGY	500	10204088	0	0	1324000
M	10300000	POWER TRANSMISSION & RECEPTION - START	0	10300000	0	0	0
	10301019	DEVELOP BASIC KLYSTRON TECHNOLOGY	750	10301019	0	0	2872000
	10301029	DEVELOP KLYSTRON COOLING CAPABILITY	600	10301029	0	0	1096000
	10301038	DEVEL INTEGR KLYSTRON & PRODUCTION TECHNOLOGY	500	10301038	0	0	1464000
	10301046	ANAL DES & TEST KLYSTRON PH OPTIONS	200	10301046	0	0	347600
	10301059	DEVELOP BASIC CFA TECHNOLOGY	750	10301059	0	0	2128000
	10301069	ANALYZE & DEVELOP CFA THERMAL CONTROL	400	10301069	0	0	610000
	10301078	DEVELOP CFA PRODUCTION TECHNOLOGY	500	10301078	0	0	1468000
	10301089	ACQUIRE & TEST CANDIDATE SOLID STATE DEVICES	400	10301089	0	0	1768400
	10301099	DESIGN & TEST HI-EFF AMPLIFIERS	400	10301099	0	0	746400
	10301109	DESIGN & TEST INTEGR AMPS, DEVEL PROD TECH	500	10301109	0	0	1352000
	10301119	INTEGRATE AMPS WITH RADIATORS	500	10301119	0	0	1774000
	10301128	SELECT & TEST OTHER AMP DEVICES	400	10301128	0	0	445600
	10302019	CONTINUE DEVEL OF SPREAD SPECTRUM PH CON	400	10302019	0	0	524800
	10302029	INVESTIGATE ALTERNATE PH CON OPTIONS	400	10302029	0	0	1049600
	10302039	BREADBOARD & EVAL PHASE CONTROL OPTIONS	400	10302039	0	0	1620000

	ACTIVITY NUMBER(S)	D E S C R I P T I O N	DURA-TION	A CODE	B CODE	C CODE	EST'D COST ($)
	10302049	DESIGN & TEST PH CON SYSTEM COMPONENTS	400	10302049	0	0	1620000
	10302059	BREADBOARD REF PHASE DISTR OPTIONS	400	10302059	0	0	1620000
	10302069	DESIGN & BREADBOARD PH CON RECEIVERS	300	10302069	0	0	564800
	10302079	TEST BASELINE & PLT ANTENNAS FOR BANDWIDTH	400	10302079	0	0	750400
	10302089	ANALYZE IONOSPHERE EFFECTS ON PH CON	1000	10302089	0	0	648000
	10304019	DESIGN FAB & TEST SUBSCALE SUBARRAYS	700	10304019	0	0	8626000
	10304028	TEST LOW-CTE APPROACHES FOR SUBARRAYS	150	10304028	0	0	251200
	10304038	TEST FOR & ELIMINATE MULTIPACTOR PROBLEMS	300	10304038	0	0	651600
	10304048	DES TEST & EVAL LOW MASS/AREA TECH	300	10304048	0	0	739600
	10305019	ANALYZE TRANSIENT & EMI EFFECTS ON ANTENNA	400	10305019	0	0	564200
	10305028	TEST & SIMULATE EMI EFFECTS	200	10305028	0	0	512400
	10305038	ANALYZE SER-PARALLEL HOOKUP OF SSPA	200	10305038	0	0	169600
	10305048	TEST SERIES-PARALLEL HOOKUP OF SSPA	300	10305048	0	0	849200
	10306018	ANALYZE & SIMULATE ANTENNA STRUC DYNAMICS	400	10306018	0	0	386400
	10307018	ANAL & SIM ANTENNA MECH AIMING & CONTROL	200	10307018	0	0	398400
	10308019	ANALYZE BEAM SAFETY & DEFINE REQD SYSTEMS	400	10308019	0	0	864000
	10309019	RESEARCH & ASSESS LASER XMSN OPTIONS	750	10309019	0	0	2700000
	10309029	TEST P/V CONVERSION OF LASER LIGHT	400	10309029	0	0	653600
	10309039	TEST ALTERNATE RECONVERSION TECHNOLOGIES	600	10309039	0	0	2262000
	10310019	ANALYZE RECTENNA OPTIONS	200	10310019	0	0	198400
	10310029	TEST RECTENNA OPTIONS	500	10310029	0	0	2046000
M	10400000	SPS STRUCTURES - START	0	10400000	0	0	0
	10401017	DEVEL & EMPLOY DETAILED STR DYN MODELS	500	10401017	0	0	1068000
	10401027	ANALYZE LIGHTWEIGHT FLEX STRUCTURES	400	10401027	0	0	854400
	10402018	FAB & TEST REPRESENTATIVE STRUCT ITEMS	300	10402018	0	0	430649
	10403018	DES, ANAL, TEST JOINTS & FASTENERS	450	10403018	0	0	1177000
	10404016	DES, ANAL, TEST THERM PROT/CONTROL TECHNOLOGY	500	10404016	0	0	958000
	10405017	ANALYZE & TEST STRUC PRODUCTION TECHNOLOGY	500	10405017	0	0	1764000
M	10500000	MATERIALS & PROCESSES - START	0	10500000	0	0	0
	10501018	SURVEY & SELECT CANDIDATE MATERIALS	200	10501018	0	0	211200
	10501028	DEVELOP MATLS LIFE TESTING TECHNOLOGY	300	10501028	0	0	459200
	10501038	LIFE TEST CANDIDATE MATERIALS	1000	10501038	0	0	3974000
	10502019	TEST HI-TEMP COMPOSITES FOR LIFE & OUTGAS	700	10502019	0	0	5812000
	10503018	DEVEL LOW-CTE WAVEGUIDE MATERIAL	350	10503018	0	0	620600
	10503027	DEVELOP OPTICS MATERIALS	350	10503027	0	0	556000
M	10600000	FLIGHT & SYSTEM CONTROL - START	0	10600000	0	0	0
	10601017	REVIEW & DEVELOP FLT CONTROL THEORY	500	10601017	0	0	617600
	10601027	DEVELOP ALGORITHMS & SOFTWARE APPROACH	700	10601027	0	0	1173760
	10602017	ANAL SENSOR REQTS & ASSESS TECHNOLOGY	200	10602017	0	0	149760
	10602027	CONDUCT SENSOR TEST PROGRAM	500	10602027	0	0	918000
	10603016	ANAL & DESIGN LARGE CMGS	200	10603016	0	0	326400
	10603026	CONDUCT WHEEL,BRNG,MOTOR RESEARCH	300	10603026	0	0	816400
	10603036	ANALYZE & TEST OTHER ACTUATION TECHNOLOGIES	300	10603036	0	0	614800
	10604017	DEVEL DATA MGMT HDWE & SFTWE APPROACH	200	10604017	0	0	339200
	10604027	DEVEL MAIN COMPUTER HDWE & SFTWE APPCH	400	10604027	0	0	713600
	10604037	DEVEL & TEST ELECTRO-OPTIC DATA ACQUIS TECH	300	10604037	0	0	1159600
M	10700000	SPACE CONSTR & MAINTENANCE - START	0	10700000	0	0	0
	10701017	CONTINUE DEVEL OF BEAM MACHINE TECH	500	10701017	0	0	4500000
	10701027	DERIVE COMPREHENSIVE STRUCT DES REQTS	200	10701027	0	0	326400

	ACTIVITY NUMBER(S)	D E S C R I P T I O N	DURATION	A CODE	B CODE	C CODE	EST'D COST ($)
	10701037	ANAL, DES, TEST ALTERNATE FAB TECHNOLOGIES	400	10701037	0	0	1152400
	10702017	DEVEL MATLS & EQUIP HANDLING TECHNIQUES	500	10702017	0	0	2438000
	10703017	DES, ANAL, FAB, TEST INTEGRITY ASSUR METHODS	500	10703017	0	0	1092000
	10704017	EVEL & ANALYZE BERTHING TECHNOLOGIES	300	10704017	0	0	638400
	10705018	ANAL, SIMULATE, TEST SOLAR ARRAY DEPLOY	500	10705018	0	0	6546000
	10706017	DEVELOP & TEST FLUIDS CHARGING TECHNOLOGY	500	10706017	0	0	926000
	10707015	DEVEL PLASTIC FILM REFLEC CONSTRUC TECH	500	10707015	0	0	954400
	10708018	DEVELOP CONDUCTOR DEPLOYMENT TECH	500	10708018	0	0	1906000
	10709018	DEVEL SUBARRAY & EQUIP INSTL TECH	700	10709018	0	0	4891200
	10710017	ANAL, DES, TEST BASE MOBILITY TECHNOLOGIES	500	10710017	0	0	2576000
	10711017	ANALYZE SIMULATION REQTS & TRAINING NEEDS	500	10711017	0	0	795200
M	10800000	SPACE TRANSPORTATION - START	0	10800000	0	0	0
	10801017	ANAL & TEST ENGINE LIFE IMPROVEMENTS	500	10801017	0	0	1806000
	10801027	RESEARCH METHANE COMBUST & HT XFER TECH	300	10801027	0	0	1130800
	10801037	CONDUCT PHASE A BOOSTER ENGINE STUDY	200	10801037	0	0	545600
	10802017	CONDUCT RLLV DESIGN & OPS STUDY	250	10802017	0	0	1174000
	10802027	DES & TEST REUSABLE LH2 INSULATION	400	10802027	0	0	1280800
	10802037	DES & TEST IMPROVED RSI APPROACHES	500	10802037	0	0	1718000
	10803017	DES ANAL & TEST IMPROVED ION THRUSTERS	600	10803017	0	0	2632400
	10803027	RESEARCH MPD THRUSTERS	600	10803027	0	0	1638000
	10803037	DEVELOP 6-DOF LOW THRUST GN&C ALGORITHMS	600	10803037	0	0	1200000
	10803048	EXTEND SOLAR CELL DEGRAD TESTS TO EOTV	500	10803048	0	0	4310000
	10804016	CONDUCT FEASIBILITY TESTS OF LASER THRUSTERS	400	10804016	0	0	3516000
	10805015	CONDUCT INTEG DES & OPS STUDY OF SPACE BASING	200	10805015	0	0	676800
	10806017	ANALYZE SEA-BASED LAUNCH SITE	350	10806017	0	0	1425200
M	10900000	POWER PROCESSING & DISTRIBUTION - START	0	10900000	0	0	0
	10901017	FAB & TEST SAMPLES OF SHEET COND WITH COATINGS	500	10901017	0	0	826000
	10901028	ANAL & TEST CONDUCTOR STRUCT SUPPORT	300	10901028	0	0	810400
	10902018	DEVEL & EMPLOY DETAILED TRANSIENT ANAL MODELS	500	10902018	0	0	1604000
	10903018	DES ANAL & TEST HV INSULATORS & STANDOFFS	350	10903018	0	0	1170600
	10904018	IDENTIFY ANAL & TEST INSULATION MATLS	700	10904018	0	0	1242000
	10905018	DESIGN LIGHTWEIGHT LIQ COOL XFORMERS	200	10905018	0	0	297600
	10905028	TEST LIGHTWEIGHT LIQUID COOLED TRANSFORMERS	450	10905028	0	0	956800
	10905058	PERFORM SUBSYS DES STUDY OF PWR PROCESSORS	200	10905058	0	0	332800
	10905048	PERFORM DESIGN STUDY OF SPLIT PROC & AC DISTR	200	10905048	0	0	297600
	10906018	DESIGN & ANALYZE CIRCUIT BREAKERS	200	10906018	0	0	332800
	10906028	FAB & TEST PROMISING CKT BRKR DESIGNS	400	10906028	0	0	3610400
	10907018	ANAL & SIMULATE EMI & MOD PWR SYS DESIGNS	400	10907018	0	0	1049600
	10908018	LIFE & VAC TEST HV SLIPRING TECH	800	10908018	0	0	2672800
M	11000000	SPACE ENVIRONMENT EFFECTS - START	0	11000000	0	0	0
	11001019	REVIEW & ANAL S/C CHARGING EFFECTS	500	11001019	0	0	994000
	11001029	CONDUCT CHAMBER TESTS OF S/C CHARGING	200	11001029	0	0	1618000
	11003018	ANALYZE MAGNETIC FIELD & TORQUE EFFECTS	300	11003018	0	0	592400
	11004019	ANALYZE SPACE PLASMA EFFECTS	300	11004019	0	0	592400
	11004029	CONDUCT ANALYTICAL ASSESSMT OF THRUSTER EFFECTS	750	11004029	0	0	1356000
	11101018	CONDUCT SILICON TECHNOLOGY ASSESSMENT	60	11101018	0	0	108000
	11101028	CONDUCT GALLIUM TECHNOLOGY ASSESSMENT	60	11101028	0	0	108000
	11101038	EVAL & ASSESS BENEFITS & TECH READINESS	60	11101038	0	0	108000
	11102015	DESIGN & SYS ANALYSIS OF THERMAL ENGINE SPSS	300	11102015	0	0	472800

	ACTIVITY NUMBERS	DESCRIPTION	DURATION	A CODE	B CODE	C CODE	EST'D COST ($)
	11102028	THERMAL ENGINE ASSESSMENT	100	11102028	0	0	157600
	11102038	THERMAL/FLUID SYSTEMS OVERALL ASSESSMENT	150	11102038	0	0	236400
	11103019	EVALUATE POWER XMSN TECH IN SYS STUDIES	750	11103019	0	0	2760000
	11103029	ASSESS & COMPARE POWER XMSN TECH	60	11103029	0	0	220800
	11103038	TRADE OFF MPTS EFF, MASS, RELIAB, ETC	200	11103038	0	0	665600
	11104018	ASSESS STRUCTURES TECNOLOGY	50	11104018	0	0	93600
	11104028	PERFORM DETAILED STRUC DESIGN & TRADEOFF	250	11104028	0	0	364000
	11104038	ANAL & EVAL ALTERNATE MECH/ELEC ROTARY JOINTS	200	11104038	0	0	339200
	11105018	SET DESIGN ALLOWABLES & OTHER CRITERIA	100	11105018	0	0	144800
	11105028	ASSESS MATERIALS TECHNOLOGIES	200	11105028	0	0	241600
	11106018	ANALYZE APPLICATION OF FLT CON TECH TO SYSTEM	200	11106018	0	0	289600
	11106028	ASSESS FLIGHT CONTROL TECHNOLOGIES	60	11106028	0	0	86880
	11106038	ANALYZE & ASSESS DATA MGMT TECHNOLOGIES	200	11106038	0	0	334400
	11106048	PERF INTEG STRUCT/CONTROLS/DATA STUDY	350	11106048	0	0	1388800
	11107018	PERFORM SPACE CONSTR SYSTEMS ANALYSES & EVAL	200	11107018	0	0	326400
	11107028	CONDUCT INTEGRATED SPACE CONSTRUCTION ANAL	350	11107028	0	0	1164800
	11108018	CONDUCT INTEGRATED SPACE TRANSPORT ANALYSIS	350	11108018	0	0	1442000
	11108028	CONDUCT SPACE TRANSPORT TECHNOLOGY & DESIGN ASSE	60	11108028	0	0	247200
	11109018	CONDUCT INTEGRATED DESIGN OF PWR PROC & DISTR	250	11109018	0	0	930500
	11109028	ASSESS POWER PROC & DISTR TECHNOLOGIES	60	11109028	0	0	223200
	11109038	CONDUCT INTEGRATED POWER SYS TRANS ANAL	300	11109038	0	0	787200
	11110019	ANALYZE SPACE ENVIR EFFECTS ON SPS DES	200	11110019	0	0	361600
	11110029	ASSESS SEVERITY OF SPACE ENVIR EFFECTS	60	11110029	0	0	108480
	11111018	MAINTAIN & UPDATE REF & ALT DES IN SYS STUDIES	1400	11111018	0	0	6003200
	11111028	ANALYZE SPS STARTUP & SHUTDOWN TRANSIENTS	200	11111028	0	0	524800
	11111038	ANALYZE & EVAL SPS DEVEL FLIGHT PROJECTS	250	11111038	0	0	1072000
M	11501018	SELECT SOLAR ARRAY TECHNOLOGIES	0	11501018	0	0	0
M	11502018	THERMAL ENGINE TECH CONTINUATION DECISION	0	11502018	0	0	0
M	11502028	FLUID SYSTEMS TECHNOLOGY SELECTION	0	11502028	0	0	0
M	11503019	SELECT TECHNOLOGIES FOR NEXT PHASE	0	11503019	0	0	0
M	11504018	SELECT STRUCTURES TECHNOLOGIES FOR NEXT PHASE	0	11504018	0	0	0
M	11505018	SELECT MATERIALS TECHNOLOGIES	0	11505018	0	0	0
M	11506018	SELECT FLIGHT CONTROL TECH & DESIGN APPROACHES	0	11506018	0	0	0
M	11506028	SELECT DATA MGMT TECH & DES APPROACH	0	11506028	0	0	0
M	11507018	SELECT SPACE CONSTR TECH & DESIGN APPROACHES	0	11507018	0	0	0
M	11508018	SELECT SPACE TRANSPORT TECHNOLOGIES & DES APPROA	0	11508018	0	0	0
M	11509018	SELECT PWR SYS TECHNOLOGIES & DES APPROACH	0	11509018	0	0	0
M	11510019	SELECT SPS TECH & DES TO MITIGATE EFFECTS	0	11510019	0	0	0
M	11511019	SELECT DEVELOPMENT FLIGHT PROJECTS	0	11511019	0	0	0
	20302019	CONDUCT LAPATS PHASE B STUDY	200	20302019	0	0	1206400
	20302028	DESIGN LG APER PH CON TECH SATELLITE	375	20302028	0	0	15060000
	20302038	FABRICATE LG APER PH CON TECH SAT	300	20302038	0	0	30810400
	20302048	TEST & C/O LG APER PH CON TECH SAT	200	20302048	0	0	10505600
	20302058	LAUNCH LG APER PH CON TECH SAT	90	20302058	0	0	26331280
	20302068	OPERATE & EVALUEATE LAPATS RESULTS	400	20302068	0	0	2686400
	20701017	CONDUCT SHUTTLE SORTIE BEAM MACHINE TEST	300	20701017	0	0	29440800
	20705017	FLIGHT TEST SOLAR ARRAY DEPLOYMENT	300	20705017	0	0	29440800
	21001019	COND SORTIE TEST OF S/C CHG & PLASMA EFF	300	21001019	0	0	31475200
	21002019	COND SORTIE TEST OF HV BREAKDOWN EFFECTS	300	21002019	0	0	6475200

PROJECT GBER — N E T W O R K L I S T I N G — PAGE 5

ACTIVITY NUMBER(S)	D E S C R I P T I O N	DURA-TION	A CODE	B CODE	C CODE	EST'D COST ($)
21004019	CONDUCT SORTIE FLT WITH ION THRUSTER	300	21004019	0	0	6475200
30303019	CONTINUE & EXTEND IONOSPH HEATING PROG	750	30303019	0	0	6428000
30303029	CONDUCT WEATHER SCATTERING EFFECTS TESTS	400	30303029	0	0	2461600
					TOTAL $	438443600

PRECEDENCE ARROWS		RELATIONSHIP	INTERVAL
10100000	10101000		
10100000	10102000		
10101000	10101018		
10101018	10101028	START-START	100
10101018	10101038	START-START	50
10101018	10101058	START-START	200
10101018	11110018		
10101028	10101048	START-START	100
10101028	10803048	START-START	100
10101028	11101018		
10101038	10101048	START-START	200
10101038	10101058	START-START	200
10101038	10104018	START-START	400
10101038	10705018	START-START	250
10101048	10101058	START-START	100
10101048	11101018		
10101058	10101068	FINISH-START	-100
10101058	11101018		
10101068	11101018		
10102000	10102018		
10102018	10102028	START-START	200
10102018	10102038	START-START	50
10102018	10102058	START-START	200
10102018	11101028		
10102028	10102048	START-START	100
10102028	10803048	START-START	100
10102028	11101028		
10102038	10102048	START-START	200
10102038	10102058	START-START	200
10102038	10104018	START-START	400
10102048	10102058	START-START	100
10102048	11101028		
10102058	10102068	FINISH-START	-100
10102058	11101028		
10102068	11101028		
10102078	11101028		
10103018	10103028	START-START	300
10103018	11101038		
10103028	10104018		
10103028	11101038		
10104018	10104028	START-START	100
10104018	11101018		
10104018	11101028		
10104018	11101038		
10104028	11501018		
10201000	10201018		
10201018	11105028		
10202015	10707015	START-START	100
10202015	11102028		

PRECEDENCE ARROWS		RELATIONSHIP	INTERVAL
10205000	11102015		
10203015	11102028		
10204017	11102028		
10204027	10204017	START-START	200
10204027	10204047	START-START	200
10204027	10204067	FINISH-START	-100
10204037	10204017	START-START	200
10204037	10204047	START-START	200
10204037	10204067	FINISH-START	-100
10204047	11102028		
10204057	11102028		
10204067	10204088	START-START	200
10204067	11102038		
10204078	11102038		
10204088	11102028		
10300000	10301019		
10300000	10301089		
10300000	10305019		
10301019	10301029	START-START	200
10301019	10301038	START-START	400
10301019	10301046	START-START	400
10301019	10304019	START-START	250
10301029	10301038	START-START	250
10301029	10301119	START-START	250
10301029	11103019	START-START	250
10301038	11103029		
10301046	11103029		
10301059	10301069	START-START	200
10301059	10304019	START-START	200
10301059	11103019	START-START	100
10301069	10301078	START-START	200
10301069	10301119	START-START	250
10301069	11103019	START-START	250
10301069	11103029		
10301078	11103029		
10301089	10301099	START-START	50
10301089	11103019	START-START	50
10301099	10301109	START-START	100
10301099	10301119	START-START	50
10301109	10304019	START-START	50
10301109	11103029		
10301119	10302079	START-START	150
10301119	10304019	START-START	250
10301119	10304038	START-START	250
10301119	10304048	START-START	250
10301119	11103038	START-START	300
10301128	11103019	FINISH-START	-100
10302019	10302039	START-START	20
10302019	10302049	START-START	50

PRECEDENCE ARROWS		RELATIONSHIP	INTERVAL
10302019	10302069	START-START	50
10302019	11103019	START-START	50
10302029	10302039	START-START	20
10302039	10302049	START-START	50
10302039	20302019	START-START	50
10302049	10302059	START-START	100
10302059	10304019	START-START	200
10302059	11103029	FINISH-START	-100
10302069	10304019	FINISH-START	-50
10302069	11103019	START-START	50
10302069	20302019	START-START	100
10302079	11103019	START-START	50
10302089	11103029		
10304019	10305019	START-START	100
10304019	11103029	FINISH-START	-100
10304028	10304019		
10304028	10304038		
10304028	11103029		
10304038	10304019	START-START	100
10304038	11103029		
10304048	11103029		
10305019	10305028	START-START	300
10305028	11103029		
10305038	10305048	START-START	150
10305048	10304019		
10305048	11103029		
10306018	11103029		
10307018	11103029		
10308019	11103029		
10309019	11103019	START-START	100
10309029	11103019	START-START	100
10309039	11103019	START-START	100
10310019	10310029	START-START	100
10310019	11103019	START-START	100
10310029	11103029		
10400000	10401017		
10401017	10307018	START-START	200
10401017	10401027	START-START	250
10401017	11104018		
10401017	11104038	START-START	200
10401017	11106048	START-START	200
10401027	11104018		
10402018	10403018	START-START	50
10402018	11104018		
10403018	10405017	START-START	200
10403018	11104018		
10404016	11105028		
10405017	11104018		
10500000	10501018		

PROJECT PRECEDENCE	GHER ARROWS	N E T W O R K L I S T I N G RELATIONSHIP	INTERVAL	PAGE 9
10501018	10501038			
10501018	11105028			
10501028	10501038	START-START	150	
10501038	11105018	FINISH-START	-200	
10502019	11105028			
10503018	11105028			
10503027	11105029			
10600000	10501017			
10600000	10504017			
10601017	10601027			
10601017	10602017	START-START	200	
10601017	11106048	START-START	200	
10601027	11106038	START-START	200	
10602017	10602027			
10602017	11106018	START-START	100	
10602027	11106028	START-START	250	
10603016	10603026			
10603026	11106028			
10603036	11106018	START-START	100	
10604017	10604027	START-START	100	
10604027	11105038			
10604037	11106038			
10700000	10701017			
10701017	11107018			
10701017	20701017			
10701027	10701037			
10701037	11107018			
10701037	11107028			
10702017	10703017	START-START	250	
10702017	10706017	START-START	250	
10702017	10707015	START-START	250	
10702017	10709018	START-START	300	
10702017	10711017			
10702017	11107018			
10703017	11107018			
10704017	11104018			
10704017	11107018			
10705018	11107018			
10705018	20705017			
10706017	11107018			
10707015	11107018			
10709018	11107018			
10709030	11107018			
10710017	10711017	START-START	250	
10710017	11107018			
10711017	11107018			
10800000	10801017			
10801017	11104017			
10801027	10801037	START-START	100	

PRECEDENCE ARROWS		RELATIONSHIP	INTERVAL
10801027	11108018		
10801037	11108018		
10802017	10801037	START-START	100
10802017	11108018		
10802027	11108018		
10802037	11108018		
10803017	10803027	START-START	100
10803017	11108018		
10803027	11108018		
10803037	11108018		
10803048	11108018		
10804016	11108018		
10805015	11108028		
10806017	11108018		
10900000	10901017		
10901017	11109018		
10901028	11109018		
10902018	10901028		
10902018	11104038		
10903019	11109018		
10904018	10903018	START-START	100
10904018	11105028		
10904018	11109018		
10905018	10905028		
10905018	10905038	START-START	100
10905028	11109018		
10905038	10905048	START-START	100
10905038	11109018		
10905048	11109018		
10906018	10906028		
10906028	11109018		
10907018	11109018		
10908018	11109018	FINISH-START	-100
11000000	11001019		
11001019	11001029		
11001029	21001019		
11003018	11110019		
11004019	11004029		
11004019	21004019		
11004029	11110019		
11101018	11501018		
11101028	11501018		
11101028	11509018		
11101038	11501018		
11102015	10202015		
11102015	11102028		
11102028	11102038		
11102028	11502018		
11102038	11502028		

PRECEDENCE ARROWS		RELATIONSHIP	INTERVAL
11103019	11103029	FINISH-START	-50
11103029	11503019		
11103038	11103019	START-START	50
11104018	11504018		
11104028	10402018	START-START	200
11104028	10403017	START-START	200
11104028	11104018		
11105018	11505018		
11105028	11505018		
11106018	11106028		
11106029	11506018		
11106038	11506028		
11106048	11106028		
11107018	11507018		
11107029	11107018		
11108018	11108028		
11108028	11508018		
11109018	11109028		
11109028	11509018		
11109038	11109018		
11110019	11110029		
11110029	11510019		
11111018	11111038	START-START	100
11211018	11503019		
11111028	11109038	START-START	200
11111038	11511019		
11501018	11503019		
11502018	11503019		
11502028	11503019		
11504018	11503019		
11505018	11503019		
11506018	11503019		
11506028	11503019		
11507018	11503019		
11508018	11503019		
11509018	11503019		
11510019	11503019		
20302019	20302028	FINISH-START	60
20302028	20302038	START-START	300
20302038	20302048	START-START	150
20302048	20302058		
20302058	20302068		
20301017	11107018		
20703017	11107018		
21001019	11110019		
21001019	21002019	START-START	30
21001019	21004019	START-START	30
21002019	11110019		
21004019	11110019		

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT GPER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 1 SOLAR ARRAYS SORT CODES 23 PAGE 1

ACTIVITY DESCRIPTION	MODE=0/FR	/...1980..../...1981..../...1982..../...1983..../...1984..../1985.
		JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
SOLAR ARRAY TECHNOLOGY: START	M	
10100000	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
SILICON ARRAYS: START	M	
10101000	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
DEVELOP BASIC CELL DESIGN & PROCESS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10101018	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
CONDUCT RADIATION EFFECTS AND ANNEALING TESTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10101028	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
DEVELOP ENCAPSULATION TECHNIQUES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10101038	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
RADIATION & ANNEAL TEST GLASSED PANELS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10101048	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & EVALUATE CELL/BLKT PROD PROCESSES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10101058	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & EVALUATE SAMPLE PRODUCTION PANELS		
10101068	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
GALLIUM ARSENIDE: START	M	
10102000	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST CELL FAB & SUBSTRATE TECHNIQUES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102018	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
RADIATION & ANNEAL TEST GAAS CELLS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102028	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & EVALUATE ENCAPSULATION TECHNIQUES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102038	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
RADIATION & ANNEAL TEST SAMPLE PANELS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102048	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & EVALUATE CELL/BLKT PROD PROCESSES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102058	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & EVALUATE SAMPLE PRODUCTION PANELS		
10102068	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
TEST & DEMONSTRATE GALLIUM RECOVERY		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10102078	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
RESEARCH ALTERNATE P/V TECHNOLOGIES		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10103018	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
EXPLORE ARRAY FAB PROCESSES FOR ALTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10103028	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
CONDUCT CHAMBER PLASMA TESTS ON CANDIDATE ARRAYS		XXXXXX
10104018	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
DEVELOP MITIGATING DESIGN OPTIONS AS REQD		XX
10104028	I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
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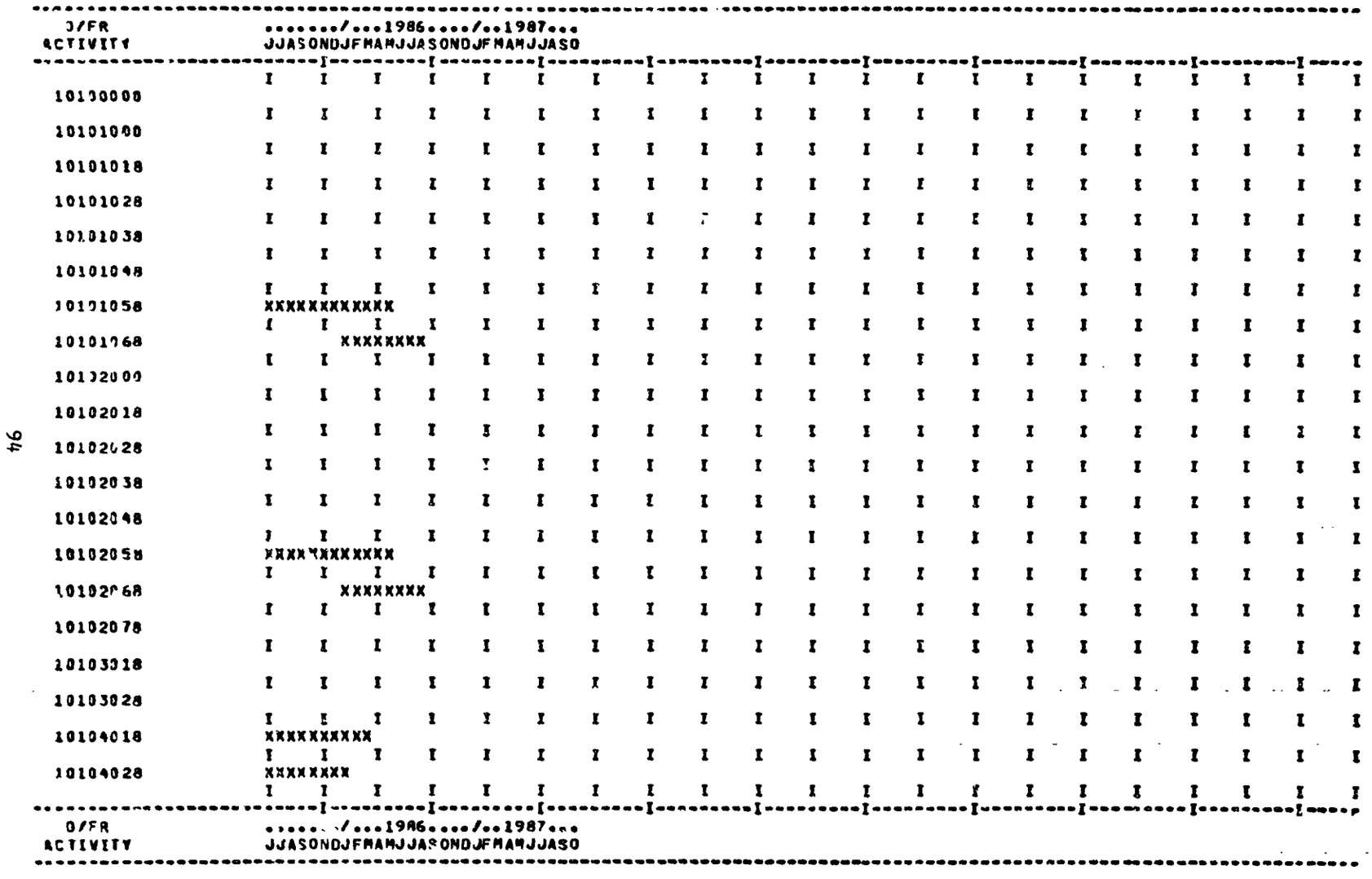
D/FR ACTIVITY
JJASONDJFMAMJJASONDJFMAMJJASO
1986
1987
10100000
10101000
10101010
10101020
10101030
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10101050
10101060
10102000
10102010
10102020
10102030
10102040
10102050
10102060
10102070
10103010
10103020
10104010
10104020

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT NUMBER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 2 THERMAL ENGINES & SYSTEMS SORT CODES 23 PAGE 1

ACTIVITY DESCRIPTION	MODE=D/FR	/...1980..../...1981..../...1982..../...1983..../...1984..../1985. JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
THERMAL SYSTEMS - START		M
10201000		
LONG-DUR THERMAL CONTROL COAT TESTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10201018		
NEW/NOVEL SUN CONCENTRATOR DESIGNS		XXXXXXXXXXXX
10202015		
THERMAL ENGINES - START		M
10203000		
CERAMIC TURBINE & HTX DEV & TEST		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10203015		
FLUID SYS & JOINTS METEOROID PROT TESTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204017		
HEAT PIPE TECHNOLOGY DEVELOPMENT		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204027		
CIRCULATING THERMAL CONTROL DEVEL		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204037		
SPACE REPAIR OF FLUID SYS TECHNOLOGY		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204047		
ZERO-G HEAT TRANSFER		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204057		
DEVEL INTEGRATED RADIATOR TECHNOLOGY		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204067		
DEVEL SPACE LIQUID METAL CONTAIN TECHNOLOGY		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10204078		
DEVELOP RADIATOR PRODUCTION TECHNOLOGY		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
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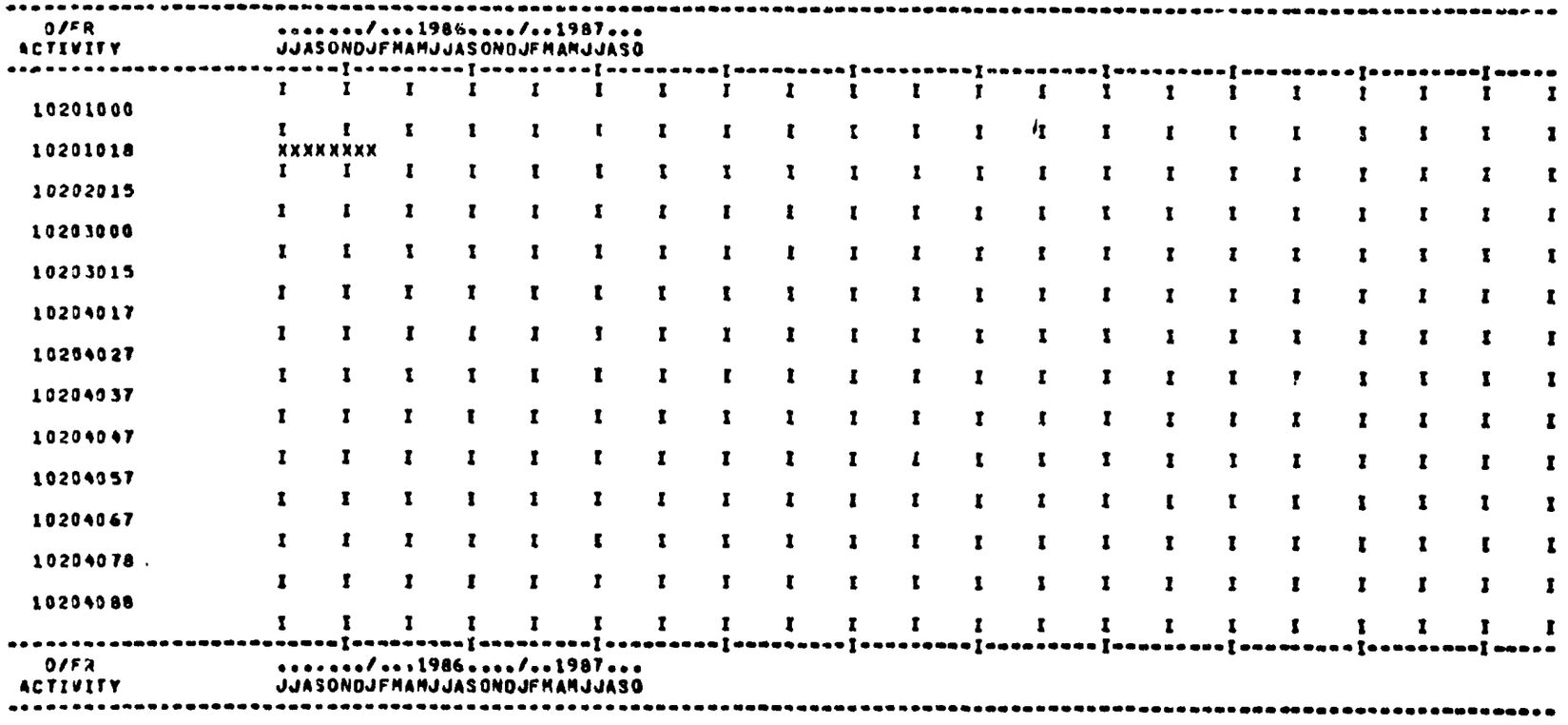
ACTIVITY DESCRIPTION	MODE=D/FR	/...1980..../...1981..../...1982..../...1983..../...1984..../1985. JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ


O/FR ACTIVITY
1986
1987
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O
10201000
10201018
10202015
10203000
10203015
10204017
10204027
10204037
10204047
10204057
10204067
10204078
10204088

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                                       SOLAR POWER SATELLITE
RUN DATE 30MAY79 1540HRS               W O R K I N G    S C H E D U L E                        PROJECT START 15JAN80
PROJECT  6BER      RESEARCH, DEVELOPMENT, & EVALUATION                                      BASE COMPLETION 23JUL87
CODE         3  MICROWAVE POWER TRANSMISSION            SORT   CODES  23                                    PAGE   1
------------------------------------------------------------------------------------------------------------------------
                                         MODE=D/FR   /...1980..../...1981..../...1982..../...1983..../...1984..../1985.
   ACTIVITY  D E S C R I P T I O N                   JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
-----------------------------------------------------I---------I---------I---------I---------I---------I---------I----.
                                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
POWER TRANSMISSION & RECEPTION - START               M
   10300000                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP BASIC KLYSTRON TECHNOLOGY                             XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10301019                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP KLYSTRON COOLING CAPABILITY                                          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10301029                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVEL INTEGR KLYSTRON & PRODUCTION TECHNOLOGY                                            XXXXXXXXXXXXXXXXXXXXXXXXXX
   10301038                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANAL DES & TEST KLYSTRON PM OPTIONS                                                      XXXXXXXXXXX
   10301046                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP BASIC CFA TECHNOLOGY                         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10301059                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE & DEVELOP CFA THERMAL CONTROL                            XXXXXXXXXXXXXXXXXXXXX
   10301069                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP CFA PRODUCTION TECHNOLOGY                                                        XXXXXXXXXXXXXXXXXXXXXXXXXX
   10301078                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
ACQUIRE & TEST CANDIDATE SOLID STATE DEVICES                     XXXXXXXXXXXXXXXXXXXXX
   10301089                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & TEST HI-EFF AMPLIFIERS                                              XXXXXXXXXXXXXXXXXXXXX
   10301099                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & TEST INTEGR AMPS, DEVEL PROD TECH                                               XXXXXXXXXXXXXXXXXXXXXXXXXX
   10301109                                          I    I    I    I    I    I    I    I    I    I    I    I    I    .
INTEGRATE AMPS WITH RADIATORS                                                            XXXXXXXXXXXXXXXXXXXXXXXXXX
   10301119                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
SELECT & TEST OTHER AMP DEVICES                                              XXXXXXXXXXXXXXXXXXXXX
   10301128                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONTINUE DEVEL OF SPREAD SPECTRUM PH CON             XXXXXXXXXXXXXXXXXXXXX
   10302019                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
INVESTIGATE ALTERNATE PH CON OPTIONS                 XXXXXXXXXXXXXXXXXXXXX
   10302029                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
BREADBOARD & EVAL PHASE CONTROL OPTIONS                          XXXXXXXXXXXXXXXXXXXXX
   10302039                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & TEST PH CON SYSTEM COMPONENTS                                       XXXXXXXXXXXXXXXXXXXXX
   10302049                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
BREADBOARD REF PHASE DISTR OPTIONS                                                       XXXXXXXXXXXXXXXXXXXXX
   10302059                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & BREADBOARD PH CON RECEIVERS                             XXXXXXXXXXXXXXXX
   10302069                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
TEST BASELINE & ALT ANTENNAS FOR BANDWIDTH                                                      XXXXXXXXXXXXXXXXXXXXX
   10302079                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE IONOSPHERE EFFECTS ON PH CON                                         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
   10302089                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN FAB & TEST SUBSCALE SUBARRAYS                                                                     XXXXXXXXXXXXXXX
   10304019                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
TEST LOW-CTE APPROACHES FOR SUBARRAYS                                                 XXXXXXXXX
   10304028                                          I    I    I    I    I    I    I    I    I    I    I    I    I    I
TEST FOR & ELIMINATE MULTIPACTOR PROBLEMS                                                                XXXXXXXXXXXXXXXX
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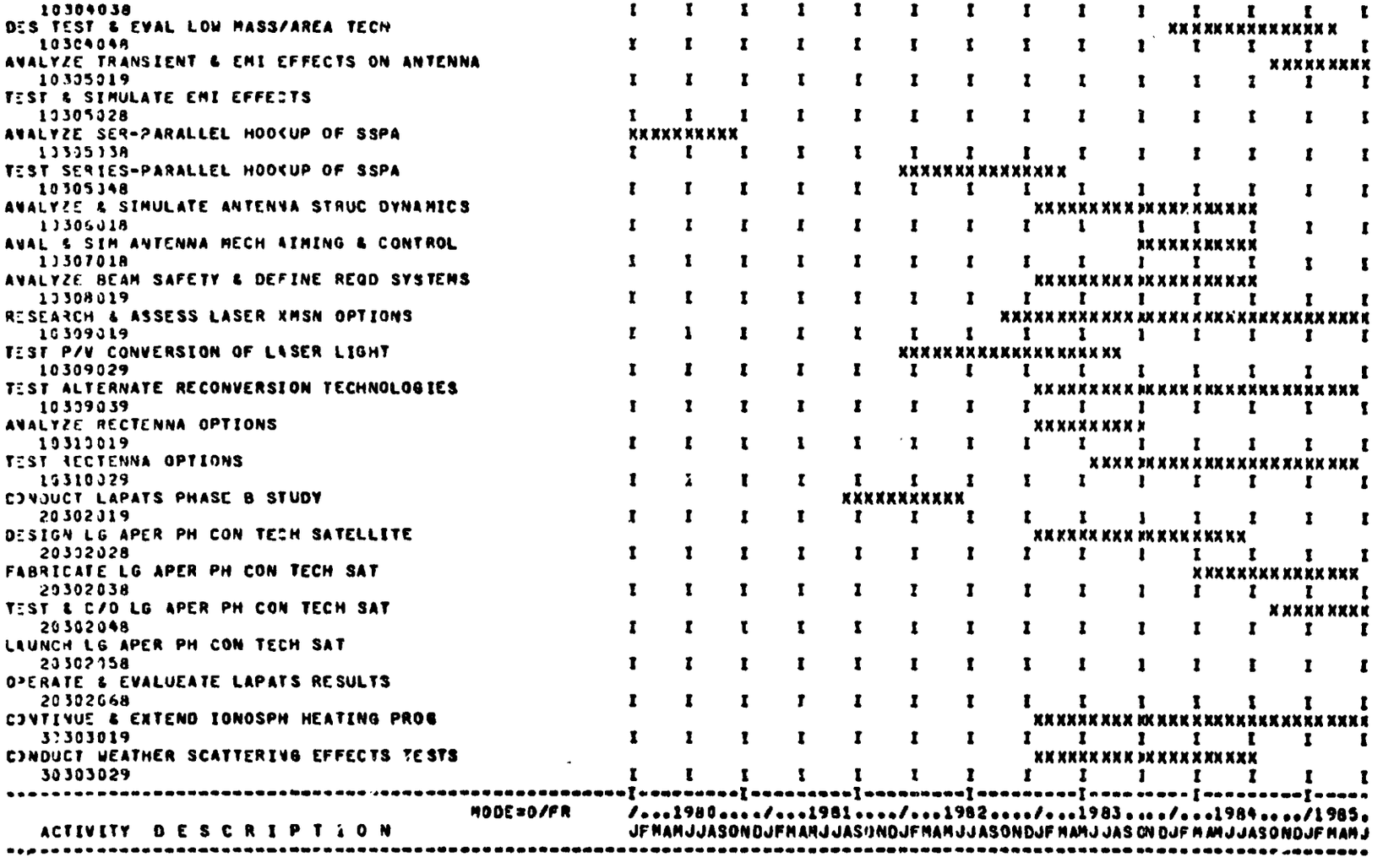
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DES TEST & EVAL LOW MASS/AREA TECH
10304048
ANALYZE TRANSIENT & EMI EFFECTS ON ANTENNA
10305019
TEST & SIMULATE EMI EFFECTS
10305028
ANALYZE SER-PARALLEL HOOKUP OF SSPA
10305038
TEST SERIES-PARALLEL HOOKUP OF SSPA
10305048
ANALYZE & SIMULATE ANTENNA STRUC DYNAMICS
10306018
ANAL & SIM ANTENNA MECH AIMING & CONTROL
10307018
ANALYZE BEAM SAFETY & DEFINE REQD SYSTEMS
10308019
RESEARCH & ASSESS LASER XMSN OPTIONS
10309019
TEST P/V CONVERSION OF LASER LIGHT
10309029
TEST ALTERNATE RECONVERSION TECHNOLOGIES
10309039
ANALYZE RECTENNA OPTIONS
10310019
TEST RECTENNA OPTIONS
10310029
CONDUCT LAPATS PHASE B STUDY
20302019
DESIGN LG APER PH CON TECH SATELLITE
20302028
FABRICATE LG APER PH CON TECH SAT
20302038
TEST & C/O LG APER PH CON TECH SAT
20302048
LAUNCH LG APER PH CON TECH SAT
20302058
OPERATE & EVALUEATE LAPATS RESULTS
20302068
CONTINUE & EXTEND IONOSPH HEATING PROG
30303019
CONDUCT WEATHER SCATTERING EFFECTS TESTS
30303029
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ACTIVITY D E S C R I P T I O N
/...1980...../...1981...../...1982...../...1983...../...1984...../1985.
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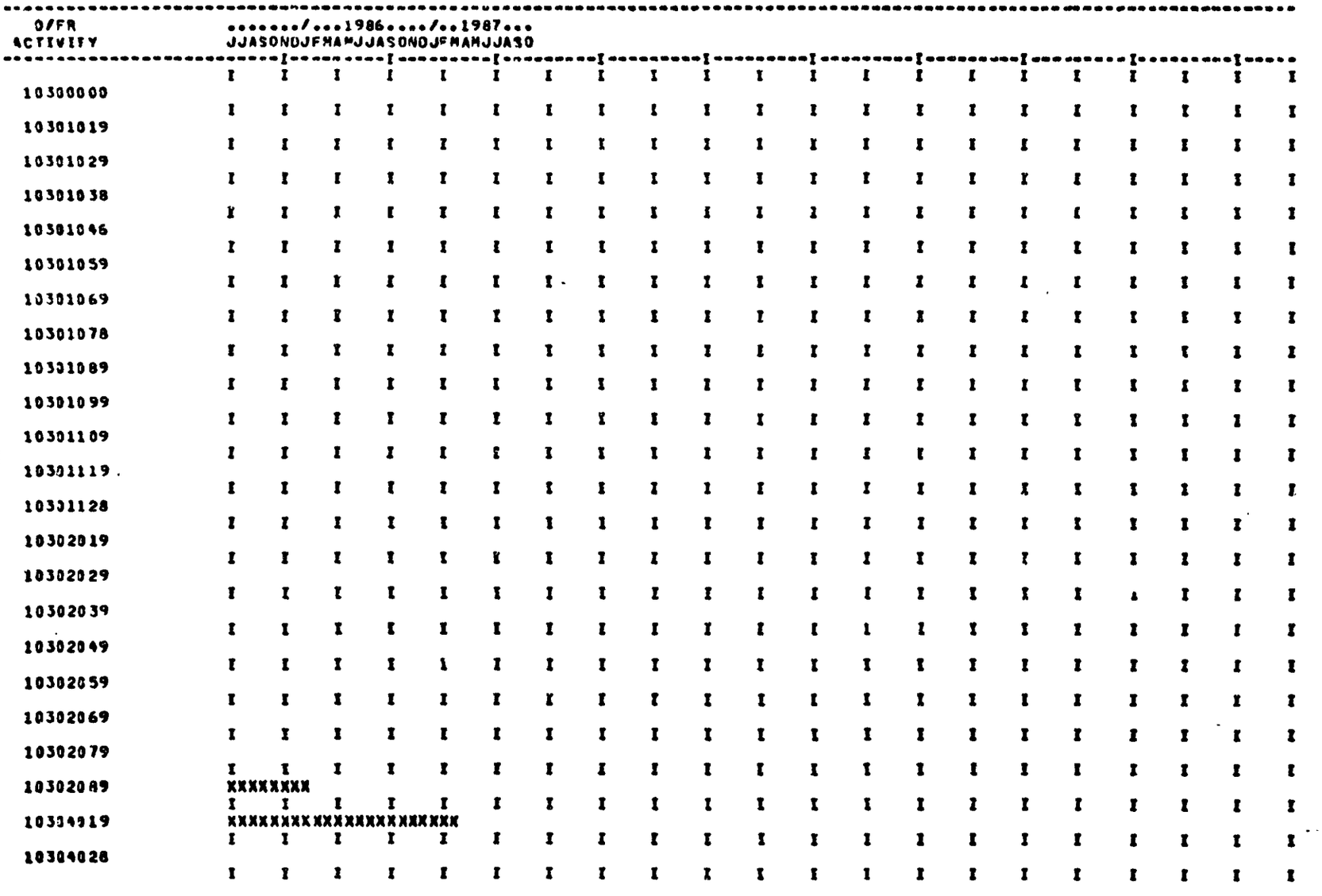
O/FR
ACTIVITY
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1986
1987
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10301069
10301078
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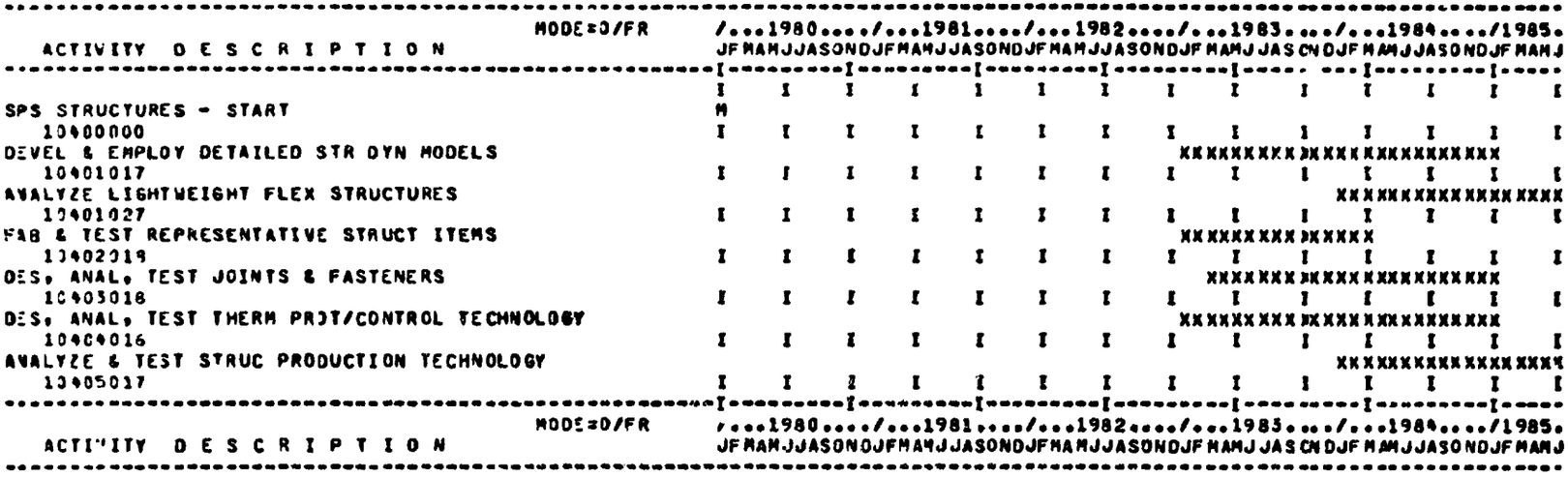
10308019
10309019
10309029
10309039
10310019
10310029
20302019
20302028
20302038
20302048
20302058
20302068
30303019
30303029
D/FR ACTIVITY
1986
1987
JJASONDJFMAMJJASONDJFMAMJJASO

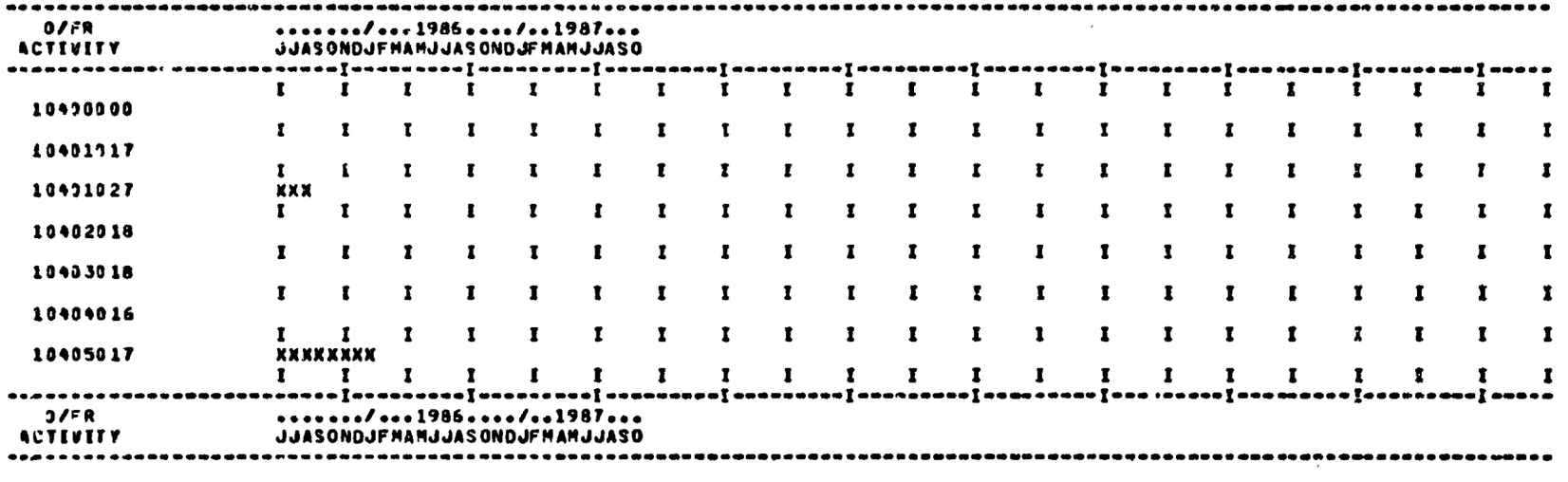
SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT 60ER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 4 STRUCTURES & DYNAMICS SORT CODES 23 PAGE 1




O/FR
ACTIVITY
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O
1986
1987
10400000
10401017
10401027
XXX
10402018
10403018
10404016
10405017
XXXXXXXX
O/FR
ACTIVITY
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O
1986
1987

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT GWER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 5 MATERIALS SORT CODES 23 PAGE 1

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   ACTIVITY  D E S C R I P T I O N            JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
                                              I    I    I    I    I    I    I    I    I    I    I    I    I    I
MATERIALS & PROCESSES - START                 M
   10500000                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
SURVEY & SELECT CANDIDATE MATERIALS                     XXXXXXXXXXX
   10501018                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP MATLS LIFE TESTING TECHNOLOGY         XXXXXXXXXXXXXXX
   10501028                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
LIFE TEST CANDIDATE MATERIALS                                  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10501038                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
TEST HI-TEMP COMPOSITES FOR LIFE & OUTGAS                                    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10502019                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVEL LOW-CTE WAVEGUIDE MATERIAL                                             XXXXXXXXXXXXXXXXXXX
   10503018                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP OPTICS MATERIALS                                                     XXXXXXXXXXXXXXXXXXX
   10503027                                   I    I    I    I    I    I    I    I    I    I    I    I    I    I
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D/FR ACTIVITY	.....1986.....1987... JJASONDJFMAMJJASONDJFMAMJJASO
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10501018	
10501028	
10501038	XXXXXXXX
10502019	XXXXX
10503018	
10503027	

D/FR ACTIVITY	.....1986.....1987... JJASONDJFMAMJJASONDJFMAMJJASO

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT 6BER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 6 FLIGHT CONTROLS & SYSTEM CONTROL SORT CODES 23 PAGE 1

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FLIGHT & SYSTEM CONTROL - START                 M
   10500000                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
REVIEW & DEVELOP FLT CONTROL THEORY                       XXXXXXXXXXXXXXXXXXXXXXXXXX
   10501017                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVELOP ALGORITHMS & SOFTWARE APPROACH                                          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10501027                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANAL SENSOR REQTS & ASSESS TECHNOLOGY                                      XXXXXXXXXX
   10502017                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT SENSOR TEST PROGRAM                                                     XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10502027                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANAL & DESIGN LARGE CMGS                                                   XXXXXXXXXX
   10503016                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT WHEEL,BRNG,MOTOR RESEARCH                                               XXXXXXXXXXXXXXXXXXXX
   10503026                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE & TEST OTHER ACTJATION TECHNOLOGIES                                XXXXXXXXXXXXXXXXX
   10503036                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVEL DATA MGMT HDWE & SFTWE APPROACH                                      XXXXXXXXXX
   10504017                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVEL MAIN COMPUTER HDWE & SFTWE APPCH                                          XXXXXXXXXXXXXXXXXXXX
   10504027                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
DEVEL & TEST ELECTRO-OPTIC DATA ACQUIS TECH                                XXXXXXXXXXXXXXX
   10604037                                     I    I    I    I    I    I    I    I    I    I    I    I    I    I
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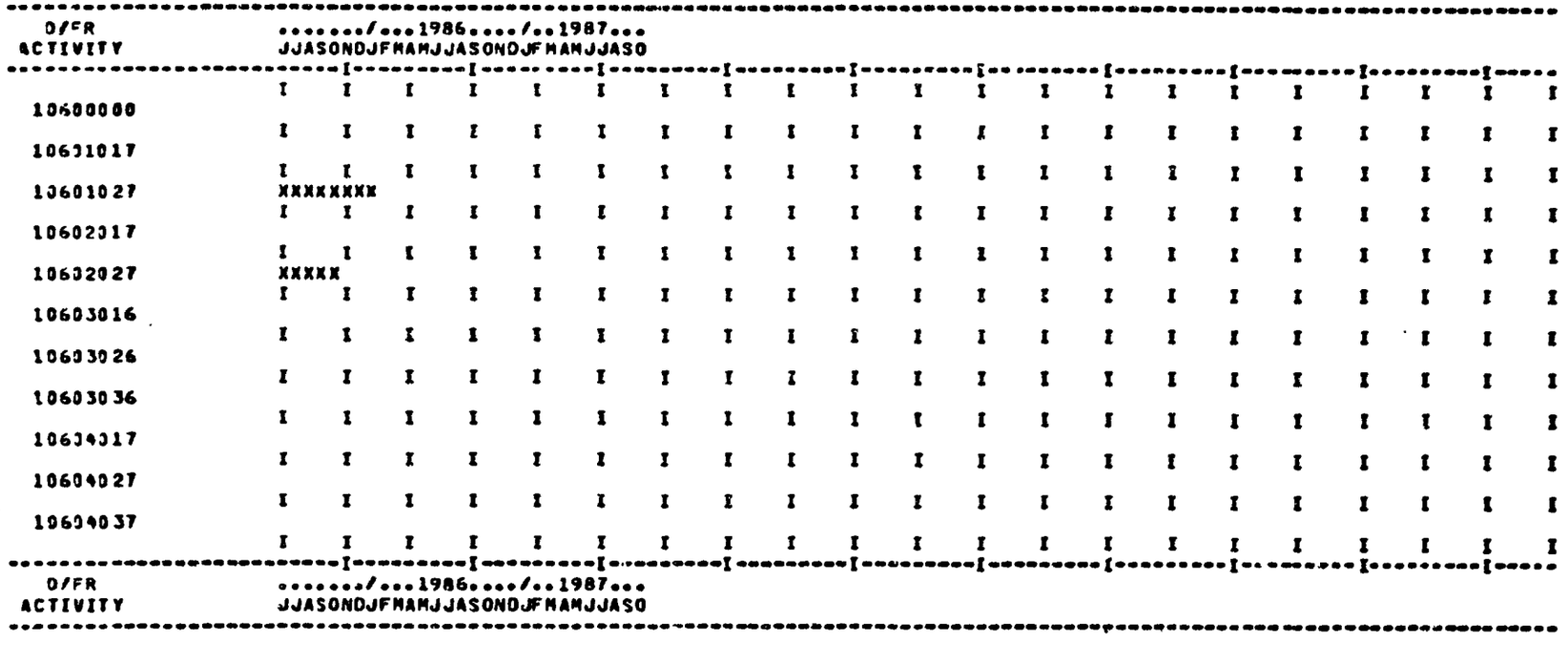
D/FR ACTIVITY
JJASONDJFMAMJJASONDJFMAMJJASO
1986
1987
10600000
10601017
10601027
10602017
10602027
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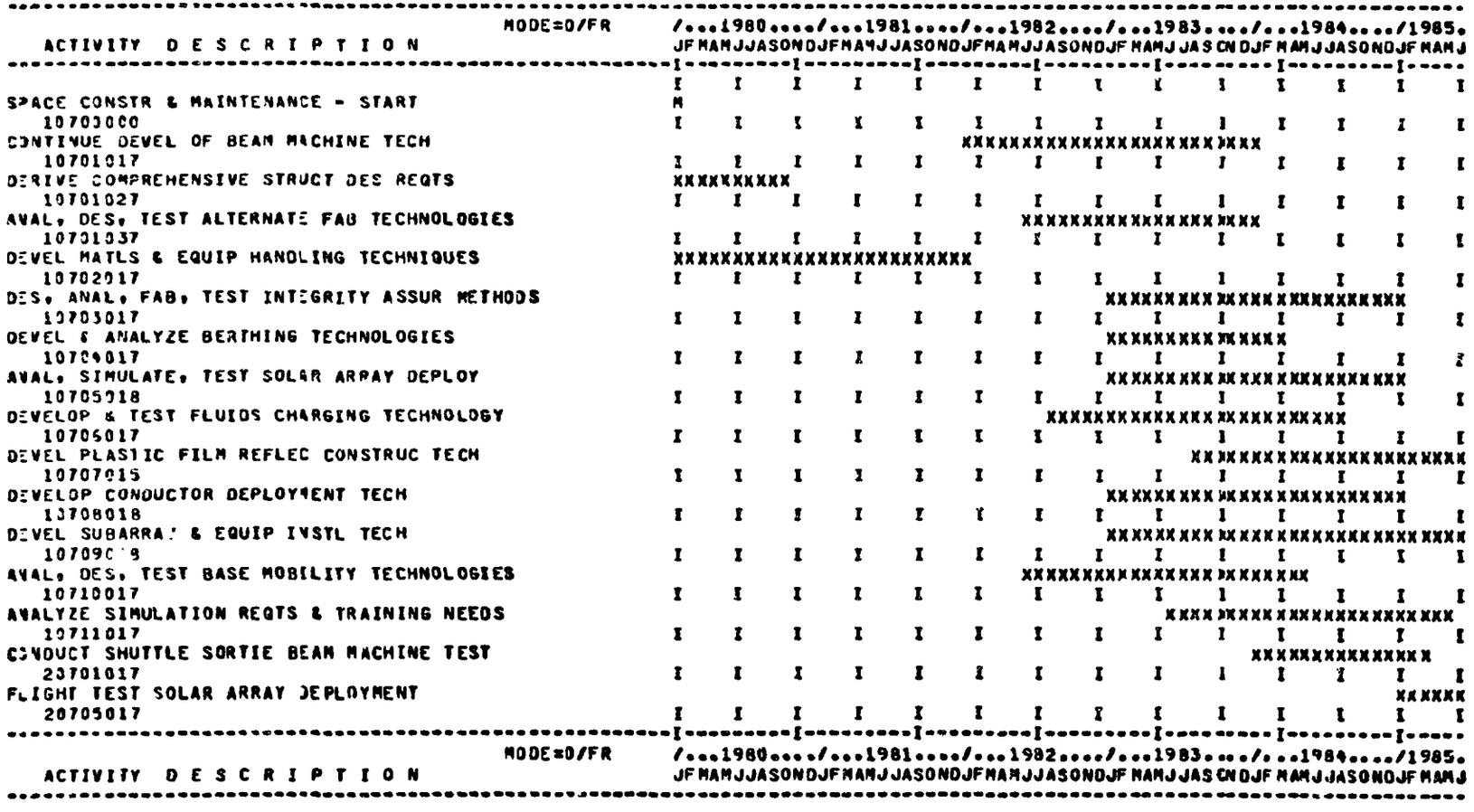
10603026
10603036
10604017
10604027
10604037

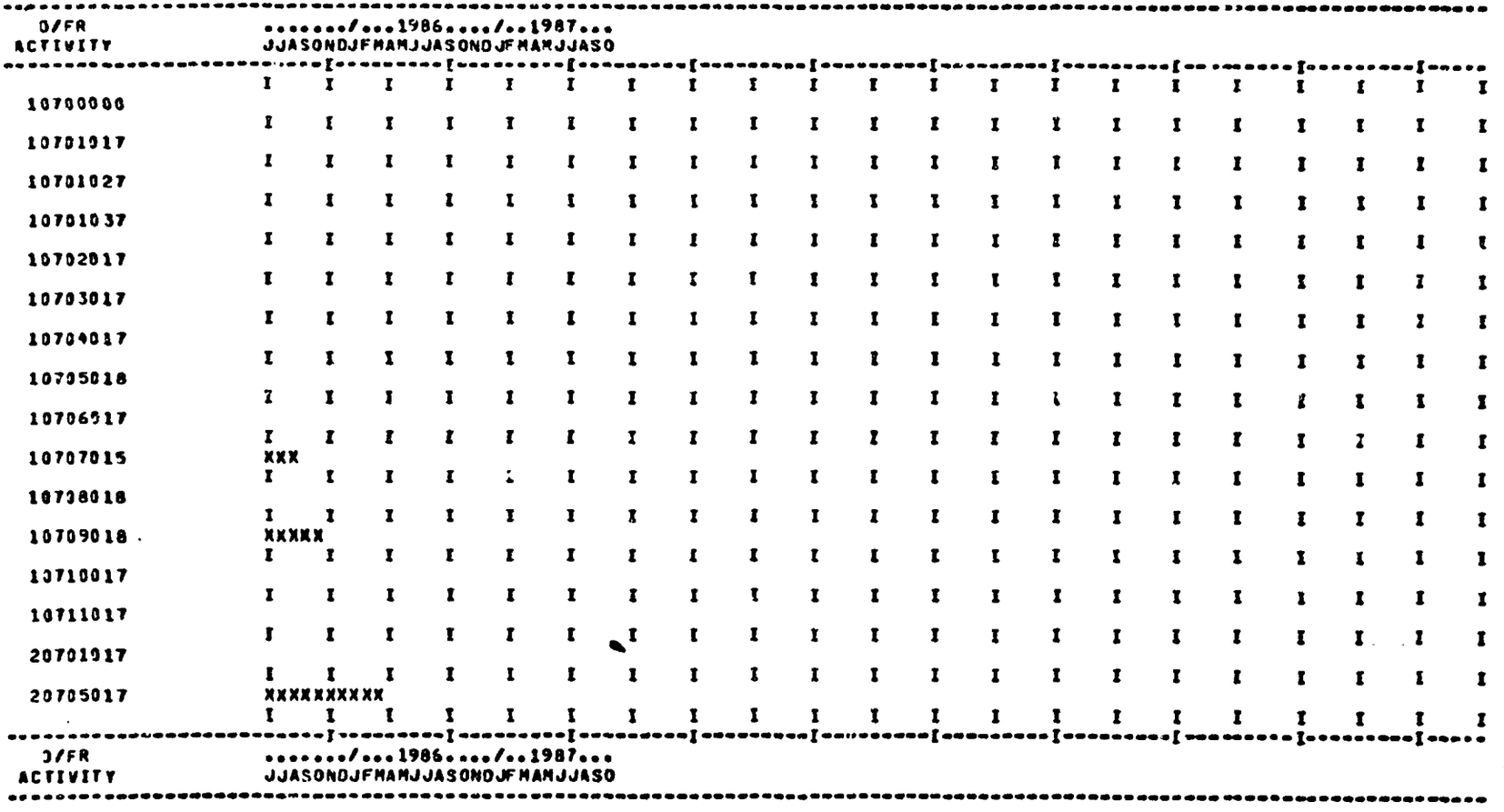
SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN83

PROJECT 68ER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 7 SPACE CONSTRUCTION SORT CODES 23 PAGE 1




D/FR ACTIVITY
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1987
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10701017
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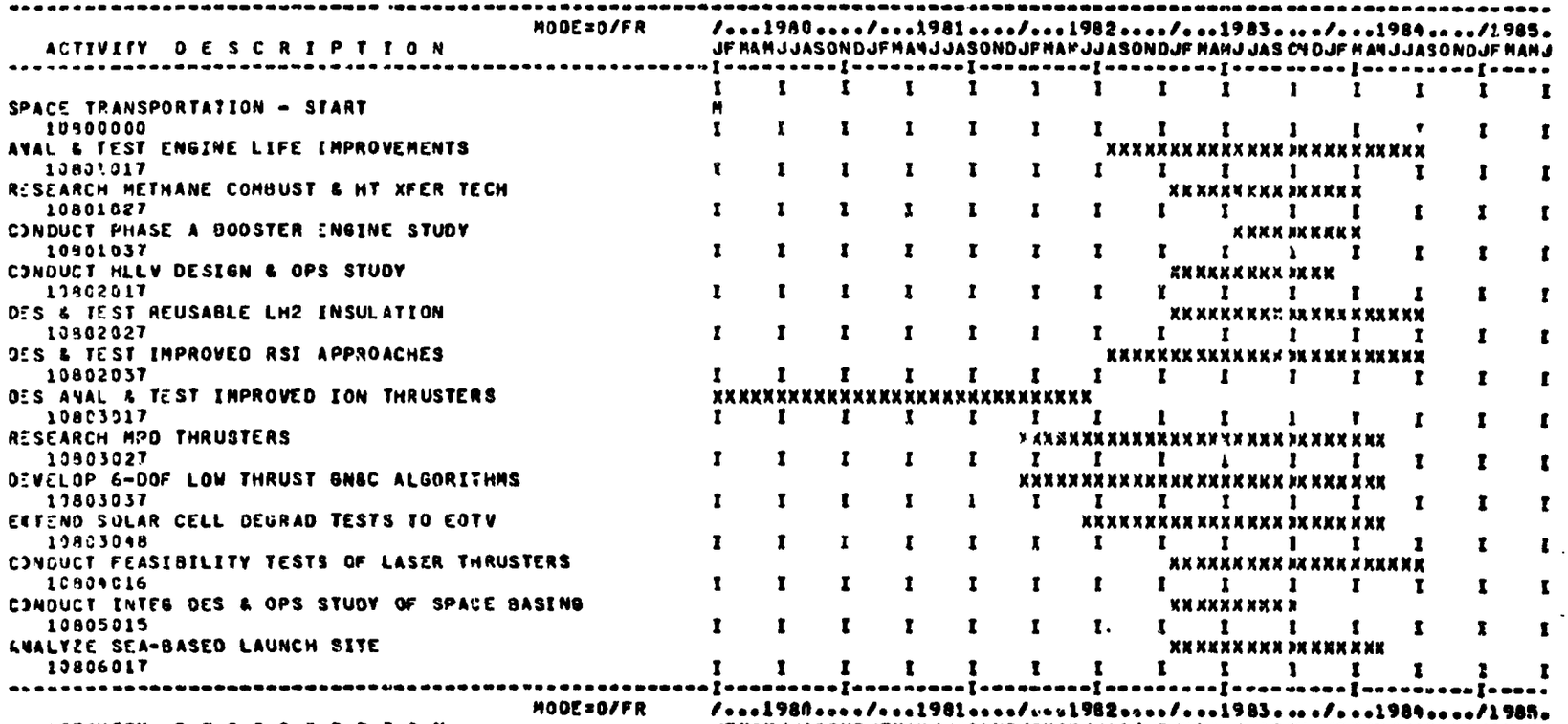
10701037
10702017
10703017
10704017
10705018
10706017
10707015
10708018
10709018
10710017
10711017
20701017
20705017
XXX
XXXXX
XXXXXXXXX
D/FR ACTIVITY
1986
1987
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT OBER RESEARCH, DEVELOPMENT, & EVALUATION BASE COMPLETION 23JUL87

CODE 8 SPACE TRANSPORTATION SORT CODES 23 PAGE 1



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RUN DATE 30MAY79 1540HRS                                  W O R K I N G    S C H E D U L E                                PROJECT START 15JAN80
PROJECT  68ER      RESEARCH, DEVELOPMENT, & EVALUATION                                                                    BASE COMPLETION 23JUL87
CODE        9  POWER DISTR & PROCESSING                   SORT   CODES  23                                                PAGE   1
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   ACTIVITY  D E S C R I P T I O N                      JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
--------------------------------------------------------I---------I---------I---------I---------I---------I---------I-----
                                                        I    I    I    I    I    I    I    I    I    I    I    I    I    I
POWER PROCESSING & DISTRIBUTION - START                 M
   10900000                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
FAB & TEST SAMPLES OF SHEET COND WITH COATINGS                                              XXXXXXXXXXXXXXXXXXXXXXXXXX
   10901017                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANAL & TEST CONDUCTOR STRUCT SUPPORT                                                        XXXXXXXXXXXXXXXX
   10901028                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
 DEVEL & EMPLOY DETAILED TRANSIENT ANAL MODELS          XXXXXXXXXXXXXXXXXXXXXXXXX
   10902018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
DES ANAL & TEST HV INSULATORS & STANDOFFS                                                   XXXXXXXXXXXXXXXXXX
   10903018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
IDENTIFY ANAL & TEST INSULATION MATLS                                           XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10904018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN LIGHTWEIGHT LIQ COOL XFORMERS                                            XXXXXXXXXXX
   10905018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
TEST LIGHTWEIGHT LIQUID COOLED TRANSFORMERS                                                 XXXXXXXXXXXXXXXXXXXXXXX
   10905028                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
PERFORM SUBSYS DES STUDY OF PWR PROCESSORS                                                  XXXXXXXXXXX
   10905038                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
PERFORM DESIGN STUDY OF SPLIT PROC & AC DISTR                                                    XXXXXXXXXXX
   10905048                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & ANALYZE CIRCUIT BREAKERS                                                      XXXXXXXXXXXX
   10906018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
FAB & TEST PROMISING CKT BRKR DESIGNS                                                            XXXXXXXXXXXXXXXXXXXXX
   10906028                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANAL & SIMULATE EMI & MOD PWR SYS DESIGNS                                                   XXXXXXXXXXXXXXXXXXXXX
   10907018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
LIFE & VAC TEST HV SLIPRING TECH                                                XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   10908018                                             I    I    I    I    I    I    I    I    I    I    I    I    I    I
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   ACTIVITY  D E S C R I P T I O N                      JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ
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SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN80

PROJECT GBER RESEARCH, DEVELOPMENT, \ EVALUATION BASE COMPLETION 23JUL87

CODE 10 SPACE ENVIRONMENT EFFECTS SORT CODES 23 PAGE 1

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CONDUCT ANALYTICAL ASSESSMT OF THRUSTER EFFECTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
11004029		
SPACE ENVIRONMENT EFFECTS - START	M	
11000000		
ANALYZE MAGNETIC FIELD & TORQUE EFFECTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
11003018		
ANALYZE SPACE PLASMA EFFECTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
11004019		
CONO SORTIE TEST OF S/C CHG & PLASMA EFF		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
21001019		
CONO SORTIE TEST OF HV BREAKDOWN EFFECTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
21002019		
CONDUCT SORTIE FLT WITH ION THRUSTER		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
21004019		
REVIEW & ANAL S/C CHARGING EFFECTS		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
11001019		
CONDUCT CHAMBER TESTS OF S/C CHARGING		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
11001029		
ACTIVITY D E S C R I P T I O N	MODE=O/FR	/...1980..../...1981..../...1982..../...1983..../...1984..../1985. JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ

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                                        SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS               W O R K I N G    S C H E D U L E                  PROJECT START 15JAN80

PROJECT  6BSR      RESEARCH, DEVELOPMENT, & EVALUATION                                    BASE COMPLETION 23JUL87

CODE        11  SPS SYSTEMS STUDIES                    SORT   CODES  23                               PAGE   1
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                                                       I    I    I    I    I    I    I    I    I    I    I    I    I    I
ASSESS MATERIALS TECHNOLOGIES
   11105028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE APPLICATION OF FLT CON TECH TO SYSTEM                                                   XXXXXXXXXX
   11106018                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ASSESS FLIGHT CONTROL TECHNOLOGIES                                                                                   XXXX
   11105028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE & ASSESS DATA MGMT TECHNOLOGIES                                                                            XXXXXX
   11106038                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
PERF INTEG STRUCT/CONTROLS/DATA STUDY                                                               XXXXXXXXXXXXXXXXXX
   11106048                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
PERFORM SPACE CONSTR SYSTEMS ANALYSES & EVAL
   11107019                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT INTEGRATED SPACE CONSTRUCTION ANAL                                                             XXXXXXXXXXXXXXXXX
   11107028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT INTEGRATED SPACE TRANSPORT ANALYSIS                                                                   XXXXXXXXXXX
   11108019                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT SPACE TRANSPORT TECHNOLOGY & DESIGN ASSE
   11108029                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT INTEGRATED DESIGN OF PWR PROC & DISTR                                                                      XXXXXX
   11109018                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ASSESS POWER PROC & DISTR TECHNOLOGIES
   11109029                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT INTEGRATED POWER SYS TRANS ANAL                                                             XXXXXXXXXXXXXXXX
   11109038                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE SPACE ENVIR EFFECTS ON SPS DES                                                                              XXXXX
   11110019                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ASSESS SEVERITY OF SPACE ENVIR EFFECTS
   11110029                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
MAINTAIN & UPDATE REF & ALT DES IN SYS STUDIES         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   11111018                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE SPS STARTUP & SHUTDOWN TRANSIENTS                                                   XXXXXXXXXX
   11111028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
ANALYZE & EVAL SPS DEVEL FLIGHT PROJECTS                                                    XXXXXXXXXXXXX
   11111038                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
THERMAL ENGINE ASSESSMENT                                                                                          XXXXX
   11102028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT SILICON TECHNOLOGY ASSESSMENT
   11101018                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
CONDUCT GALLIUM TECHNOLOGY ASSESSMENT
   11101028                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
EVAL & ASSESS BENEFITS & TECH READINESS
   11101038                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
DESIGN & SYS ANALYSIS OF THERMAL ENGINE SPSS                                        XXXXXXXXXXXXXXX
   11102015                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
THERMAL/FLUID SYSTEMS OVERALL ASSESSMENT                                                                                XX
   11102038                                            I    I    I    I    I    I    I    I    I    I    I    I    I    I
EVALUATE POWER XMSN TECH IN SYS STUDIES                                                                     XXXXXXXXXXXXXX
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   11103019                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
ASSESS & COMPARE POWER XMSN TECH
   11103029                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
TRADE OFF MPTS EFF, MASS, RELIAB, ETC                                                  XXXXXXXXXXX
   11103038                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
ASSESS STRUCTURES TECHNOLOGY
   11104019                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
PERFORM DETAILED STRUC DESIGN & TRADEOFF                          XXXXXXXXXXXXXX
   11104028                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
AVAL & EVAL ALTERNATE MECH/ELEC ROTARY JOINTS                                      XXXXXXXXXXXXX
   11104038                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
SET DESIGN ALLOWABLES & OTHER CRITERIA                                                                 XXXX
   11105318                                 I   I   I   I   I   I   I   I   I   I   I   I   I   I   I   I
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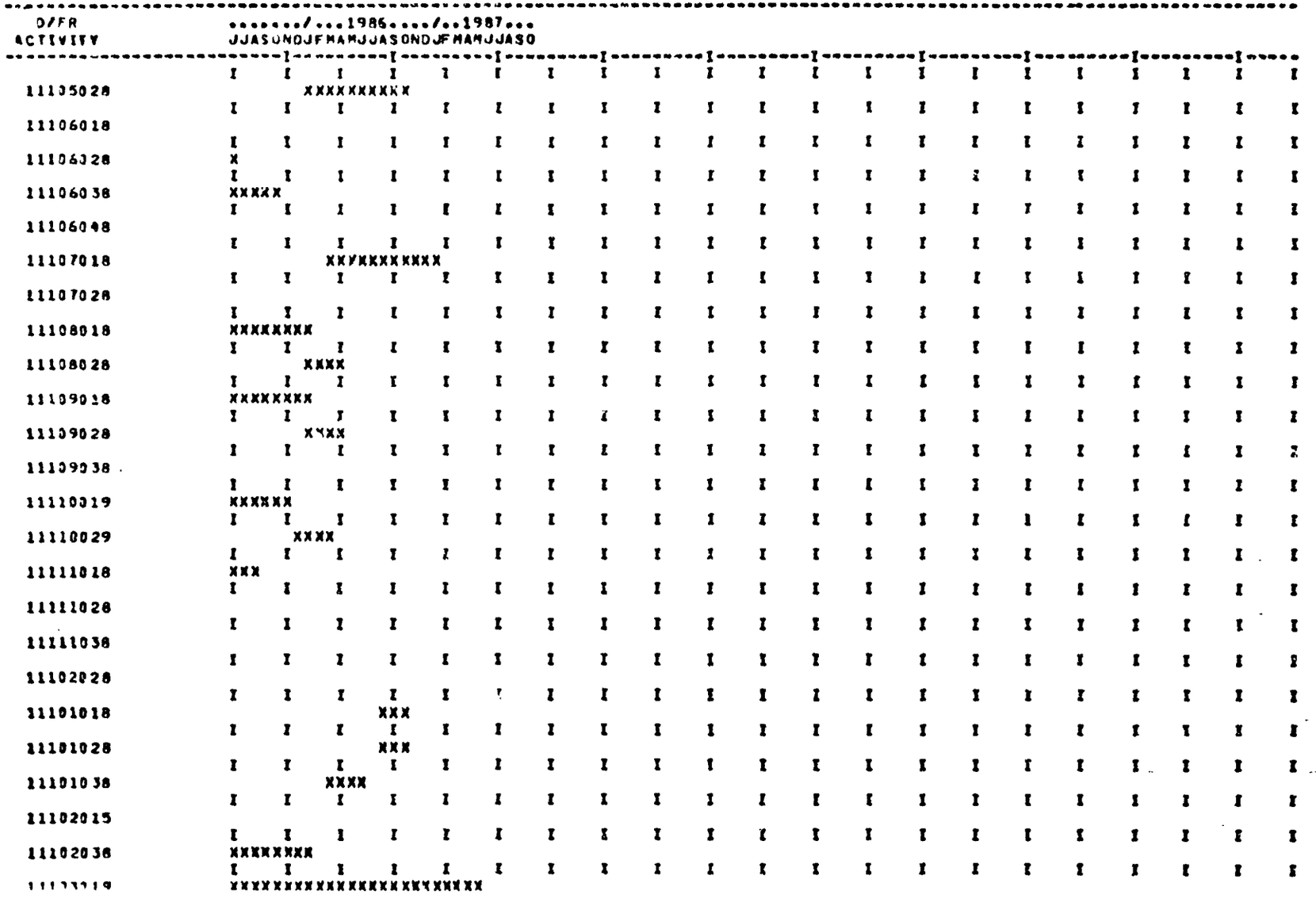
D/FR ACTIVITY
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1987
J J A S O N D J F M A M J J A S O N D J F M A M J J A S O
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11107018
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11104038
11105018
XXXX
XXXX
XXX
O/FR
ACTIVITY
1986
1987
JJASONDJFMAMJJASONDJFMAMJJASO

SOLAR POWER SATELLITE

RUN DATE 30MAY79 1540HRS W O R K I N G S C H E D U L E PROJECT START 15JAN83

PROJECT GHER RESEARCH, DEVELOPMENT, & EVALUATION BASE CON TION 23JUL87

CODE 15 TECHNOLOGY & DESIGN SELECTION SORT CODES 23 PAGE 1

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11501018		M
THERMAL ENGINE TECH CONTINUATION DECISION		
11502018		M
FLUID SYSTEMS TECHNOLOGY SELECTION		
11502028		M
SELECT TECHNOLOGIES FOR NEXT PHASE		
11503019		M
SELECT STRUCTURES TECHNOLOGIES FOR NEXT PHASE		
11504018		M
SELECT MATERIALS TECHNOLOGIES		
11505019		M
SELECT FLIGHT CONTROL TECH & DESIGN APPROACHES		
11506018		M
SELECT DATA MGMT TECH & DES APPROACH		
11506028		M
SELECT SPACE CONSTR TECH & DESIGN APPROACHES		
11507018		M
SELECT SPACE TRANSPORT TECHNOLOGIES & DES APPROA		
11508018		M
SELECT PWR SYS TECHNOLOGIES & DES APPROACH		
11509018		M
SELECT SPS TECH & DES TO MITIGATE EFFECTS		
11510019		M
SELECT DEVELOPMENT FLIGHT PROJECTS		
11511019		M
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SOLAR POWER SATELLITE

RUN DATE 25MAY79 1205HRS — RESOURCE ALLOCATION BY ACTIVITIES — PROJECT START 15JAN80

PROJECT GBER — RESEARCH, DEVELOPMENT, & EVALUATION — BASE COMPLETION 1APR86

SORT NODES —

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
10101018		DEVELOP BASIC CELL DESIGN & PROCESS				750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	6.0	4500.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	2250.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	3.0	2250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	6.0	4500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	2250.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	2250.0	MAN DAYS			
	4.00	MANUFACTURING	6.0	4500.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	6.0	4500.0	MAN DAYS			
10101028		CONDUCT RADIATION EFFECTS AND ANNEALING TESTS				500	4JUN80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	4.0	2000.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1000.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1000.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	500.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	250.0	EQP DAYS			
	10.30	LARGE COMB ENVIR CHAMBER	0.5	250.0	TESTDAYS			
10101038		DEVELOP ENCAPSULATION TECHNIQUES				750	25MAR80	22MAR83
	1.00	TECHNOLOGY ENGINEERING	9.0	6750.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1500.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	4.0	3000.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	3.0	2250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	8.0	6000.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	4.0	3000.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	4.0	3000.0	MAN DAYS			
	4.00	MANUFACTURING	4.0	3000.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	2.0	1500.0	MAN DAYS			
10101048		RADIATION & ANNEAL TEST GLASSED PANELS				300	15JAN81	29MAR82
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	600.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	900.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	600.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	300.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	300.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	150.0	EQP DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	10.30	LARGE COMB ENVIR CHAMBER	0.5	150.0	TESTDAYS			
10101058		TEST & EVALUATE CELL/BLKT PROD PROCESSES				750	4JUN81	29MAY84
	1.00	TECHNOLOGY ENGINEERING	10.0	7500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	750.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	750.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	750.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	1500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	4.0	3000.0	MAN DAYS			
	1.90	CIVIL & FACILITIES ENGINEERING	1.0	750.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	8.0	6000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	2.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	1500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	7.0	5250.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	750.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	750.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	750.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	4.0	3000.0	MAN DAYS			
10101068		TEST & EVALUATE SAMPLE PRODUCTION PANELS				150	11JAN84	9AUG84
	1.00	TECHNOLOGY ENGINEERING	1.0	150.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	150.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.0	600.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	150.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	150.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	300.0	MAN DAYS			
10102018		TEST CELL FAB & SUBSTRATE TECHNIQUES				850	15JAN80	1JUN83
	1.00	TECHNOLOGY ENGINEERING	6.0	5100.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	2550.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	3.0	2550.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	6.0	5100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	2550.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	2550.0	MAN DAYS			
	4.00	MANUFACTURING	6.0	5100.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	6.0	5100.0	MAN DAYS			
10102028		RADIATION & ANNEAL TEST GAAS CELLS				500	24OCT80	21OCT82
	1.00	TECHNOLOGY ENGINEERING	4.0	2000.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1000.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1000.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	500.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	250.0	EQP DAYS			
	10.30	LARGE COMB ENVIR CHAMBER	0.5	250.0	TESTDAYS			
10102038		TEST & EVALUATE ENCAPSULATION TECHNIQUES				750	25MAR80	22MAR83

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	9.0	6750.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	1500.0	MAN	DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	4.0	3000.0	MAN	DAYS		
	1.60	PHYSICS TECHNOLOGY	3.0	2250.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	8.0	6000.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	4.0	3000.0	MAN	DAYS		
	3.50	ELECTRICAL LAB TECHS	4.0	3000.0	MAN	DAYS		
	4.00	MANUFACTURING	4.0	3000.0	MAN	DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1500.0	MAN	DAYS		
	4.50	SPECIALTY SHOP	2.0	1500.0	MAN	DAYS		
10102048		RADIATION & ANNEAL TEST SAMPLE PANELS				300	26MAR81	2JUN82
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	600.0	MAN	DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	3.0	900.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN	DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	600.0	MAN	DAYS		
	4.00	MANUFACTURING	1.0	300.0	MAN	DAYS		
	4.50	SPECIALTY SHOP	1.0	300.0	MAN	DAYS		
	10.00	SPECIAL FACILITIES	0.5	150.0	EQP	DAYS		
	10.30	LARGE COMB ENVIR CHAMBER	0.5	150.0	TEST	DAYS		
10102058		TEST & EVALUATE CELL/BLKT PROD PROCESSES				750	13AUG81	9AUG84
	1.00	TECHNOLOGY ENGINEERING	10.0	7500.0	MAN	DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	750.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	750.0	MAN	DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	750.0	MAN	DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	1500.0	MAN	DAYS		
	1.80	INDUST DESIGN & PLANT ENGR	4.0	3000.0	MAN	DAYS		
	1.90	CIVIL & FACILITIES ENGINEERING	1.0	750.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	8.0	6000.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	2.0	1500.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	2.0	1500.0	MAN	DAYS		
	3.40	MECHANICAL LAB TECHS	2.0	1500.0	MAN	DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN	DAYS		
	4.00	MANUFACTURING	7.0	5250.0	MAN	DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	750.0	MAN	DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	750.0	MAN	DAYS		
	4.50	SPECIALTY SHOP	1.0	750.0	MAN	DAYS		
	4.80	PROCESS PLANT SHOP	4.0	3000.0	MAN	DAYS		
10102068		TEST & EVALUATE SAMPLE PRODUCTION PANELS				150	21MAR84	18OCT84
	1.00	TECHNOLOGY ENGINEERING	1.0	150.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	150.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	4.0	600.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	150.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	150.0	MAN	DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	300.0	MAN	DAYS		
10102078		TEST & DEMONSTRATE GALLIUM RECOVERY				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	3.0	1200.0	MAN	DAYS		

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.50	CHEMICAL/PROCESS ENGINEERING	2.0	800.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	1200.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	400.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	2.0	800.0	MAN DAYS			
10103018		RESEARCH ALTERNATE P/V TECHNOLOGIES				750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	4.0	3000.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1500.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.0	3000.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	1500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1500.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1500.0	MAN DAYS			
10103028		EXPLORE ARRAY FAB PROCESSES FOR ALTS				750	26MAR81	20MAR84
	1.00	TECHNOLOGY ENGINEERING	6.0	4500.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1500.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	2.0	1500.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.0	3000.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	1500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	4.0	3000.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	2.0	1500.0	MAN DAYS			
10104018		CONDUCT CHAMBER PLASMA TESTS ON CANDIDATE ARRAYS				300	21MAR84	27MAY85
	1.00	TECHNOLOGY ENGINEERING	2.0	600.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	300.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	750.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	1.0	300.0	EQP DAYS			
	10.20	SMALL COMB ENVIR CHAMBER	1.0	300.0	TESTDAYS			
10104028		DEVELOP MITIGATING DESIGN OPTIONS AS REQD				150	10AUG84	18MAR85
	1.00	TECHNOLOGY ENGINEERING	2.0	300.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	150.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	150.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	150.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	150.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	75.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	75.0	MAN DAYS			
10201018		LONG-DUR THERMAL CONTROL COAT TESTS				1250	15JAN80	7JAN85
	1.00	TECHNOLOGY ENGINEERING	0.8	937.5	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINIS'
	1.10	MECHANICAL/STRUCT ENGINEERING	0.3	312.5	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	0.3	312.5	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	0.3	312.5	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	1250.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	1250.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.5	625.0	EQP DAYS		
	10.20	SMALL COMB ENVIR CHAMBER	0.5	625.0	TESTDAYS		
10202015		NEW/NOVEL SUN CONCENTRATOR DESIGNS			200	26MAR81	13JAN82
	1.00	TECHNOLOGY ENGINEERING	1.0	200.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS		
10203015		CERAMIC TURBINE & HTX DEV & TEST			750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	2.5	1875.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1500.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	375.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.5	1875.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	750.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	375.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	750.0	MAN DAYS		
	4.00	MANUFACTURING	1.2	900.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	750.0	MAN DAYS		
	4.50	SPECIALTY SHOP	0.2	150.0	MAN DAYS		
10204017		FLUID SYS & JOINTS METEOROID PROT TESTS			450	24OCT30	11AUG82
	1.00	TECHNOLOGY ENGINEERING	2.5	1125.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	900.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	0.5	225.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	900.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	450.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	450.0	MAN DAYS		
	4.00	MANUFACTURING	1.5	675.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	450.0	MAN DAYS		
	4.50	SPECIALTY SHOP	0.5	225.0	MAN DAYS		
10204027		HEAT PIPE TECHNOLOGY DEVELOPMENT			500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	1.0	500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	250.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	0.5	250.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	750.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS		
10204037		CIRCULATING THERMAL CONTROL DEVEL			500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	1.0	500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	250.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	0.5	250.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	750.0	MAN DAYS		

ACTIVITY NODE NO/FE	DESCRIPTION RESOURCE	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	3.10 ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS			
	3.40 MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
10204047	SPACE REPAIR OF FLUID SYS TECHNOLOGY				300	24OCT80	15JAN82
	1.00 TECHNOLOGY ENGINEERING	1.0	300.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	0.5	150.0	MAN DAYS			
	1.50 CHEMICAL/PROCESS ENGINEERING	0.5	150.0	MAN DAYS			
	2.00 PROJECT ENGINEERING	0.5	150.0	MAN DAYS			
	2.60 HUMAN FACTORS & SIM ENGR	0.5	150.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	1.0	300.0	MAN DAYS			
	3.20 CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	3.30 COMPUTER OPERATIONS	0.5	150.0	MAN DAYS			
	4.00 MANUFACTURING	2.0	600.0	MAN DAYS			
	4.10 MECH/STRUCT DEV SHOP	1.0	300.0	MAN DAYS			
	4.50 SPECIALTY SHOP	1.0	300.0	MAN DAYS			
10204057	ZERO-G HEAT TRANSFER				400	15JAN80	12AUG82
	1.00 TECHNOLOGY ENGINEERING	2.5	1000.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	800.0	MAN DAYS			
	1.60 PHYSICS TECHNOLOGY	0.5	200.0	MAN DAYS			
	2.00 PROJECT ENGINEERING	0.5	200.0	MAN DAYS			
	2.10 SYS ANALYSIS/CONFIG ENGR	0.5	200.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10 ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.40 MECHANICAL LAB TECHS	1.0	400.0	MAN DAYS			
	4.00 MANUFACTURING	1.0	400.0	MAN DAYS			
	4.10 MECH/STRUCT DEV SHOP	1.0	400.0	MAN DAYS			
10204067	DEVEL INTEGRATED RADIATOR TECHNOLOGY				400	13AUG81	22MAR83
	1.00 TECHNOLOGY ENGINEERING	2.5	1000.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	800.0	MAN DAYS			
	1.60 PHYSICS TECHNOLOGY	0.5	200.0	MAN DAYS			
	2.00 PROJECT ENGINEERING	0.5	200.0	MAN DAYS			
	2.10 SYS ANALYSIS/CONFIG ENGR	0.5	200.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10 ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.40 MECHANICAL LAB TECHS	1.0	400.0	MAN DAYS			
	4.00 MANUFACTURING	1.0	400.0	MAN DAYS			
	4.10 MECH/STRUCT DEV SHOP	1.0	400.0	MAN DAYS			
10204078	DEVEL SPACE LIQUID METAL CONTAIN TECHNOLOGY				700	15JAN80	21OCT82
	1.00 TECHNOLOGY ENGINEERING	1.5	1050.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	1.0	700.0	MAN DAYS			
	1.50 CHEMICAL/PROCESS ENGINEERING	0.5	350.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	1.0	700.0	MAN DAYS			
	3.20 CLERICAL GRAPHICS	0.5	350.0	MAN DAYS			
	3.40 MECHANIC LAB TECHS	0.5	350.0	MAN DAYS			
	4.00 MANUFACTURING	0.5	350.0	MAN DAYS			
	4.10 MECH/STRUCT DEV SHOP	0.5	350.0	MAN DAYS			
10204088	DEVELOP RADIATOR PRODUCTION TECHNOLOGY				500	12AUG82	9AUG84
	1.00 TECHNOLOGY ENGINEERING	3.0	1500.0	MAN DAYS			

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	2.0	1000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	1.0	500.0	MAN DAYS			
10301019		DEVELOP BASIC KLYSTRON TECHNOLOGY				750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	2.5	1875.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	375.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	2250.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	375.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	375.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	2250.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	750.0	MAN DAYS			
10301029		DEVELOP KLYSTRON COOLING CAPABILITY				600	24OCT80	22MAR83
	1.00	TECHNOLOGY ENGINEERING	2.5	1500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	600.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	300.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	300.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	600.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	300.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	0.5	300.0	MAN DAYS			
10301038		DEVEL INTEGR KLYSTRON & PRODUCTION TECHNOLOGY				500	23OCT81	21OCT83
	1.00	TECHNOLOGY ENGINEERING	2.5	1250.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	250.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	1250.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	2.0	1000.0	MAN DAYS			
10301046		ANAL DES & TEST KLYSTRON PH OPTIONS				200	13AUG81	2JUN82
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	200.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	200.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	200.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
10301059		DEVELOP BASIC CFA TECHNOLOGY				750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	2.5	1875.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	375.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	2250.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	375.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	375.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	1.5	1125.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	750.0	MAN DAYS			
	4.50	SPECIALTY SHOP	0.5	375.0	MAN DAYS			
10301069		ANALYZE & DEVELOP CFA THERMAL CONTROL				400	240CT80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	1.5	600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	400.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	200.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	200.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	400.0	MAN DAYS			
10301078		DEVELOP CFA PRODUCTION TECHNOLOGY				500	13AUG81	11AUG83
	1.00	TECHNOLOGY ENGINEERING	2.5	1250.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	250.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	1250.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	2.0	1000.0	MAN DAYS			
10301089		ACQUIRE & TEST CANDIDATE SOLID STATE DEVICES				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	4.5	1800.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	3.0	1200.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.5	600.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.5	1800.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.5	600.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	1200.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	1200.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	3.0	1200.0	MAN DAYS			
10301099		DESIGN & TEST HI-EFF AMPLIFIERS				400	25MAR80	22OCT81
	1.00	TECHNOLOGY ENGINEERING	2.0	800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.5	600.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	400.0	MAN DAYS			

ACTIVITY NODE=O/FE	DESCRIPTION RESOURCE		DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	400.0	MAN DAYS			
10301109		DESIGN & TEST INTEGR AMPS, DEVEL PROD TECH				500	14AUG80	11AUG82
	1.00	TECHNOLOGY ENGINEERING	3.0	1500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	750.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	500.0	MAN DAYS			
	4.40	ELEC/ELECTRONIC PRODUCTION SHOP	0.5	250.0	MAN DAYS			
	4.80	PROCESS PLANT SHOP	0.5	250.0	MAN DAYS			
10301119		INTEGRATE AMPS WITH RADIATORS				500	230CT81	21OCT83
	1.00	TECHNOLOGY ENGINEERING	4.0	2000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	3.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.5	1750.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1000.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1000.0	MAN DAYS			
10301128		SELECT & TEST OTHER AMP DEVICES				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	1.5	600.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	400.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	200.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	400.0	MAN DAYS			
10302019		CONTINUE DEVEL OF SPREAD SPECTRUM PH COM				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	3.0	1200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	800.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	400.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS			
10302029		INVESTIGATE ALTERNATE PH CON OPTIONS				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	6.0	2400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	4.0	1600.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	800.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS			
10302039		BREADBOARD & EVAL PHASE CONTROL OPTIONS				400	12FEB80	10SEP81
	1.00	TECHNOLOGY ENGINEERING	6.0	2400.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	OUR	START	FINISH
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	4.0	1600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	4.0	1600.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	800.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	800.0	MAN DAYS		
	4.70	TEST & CHECKOUT LAB	2.0	800.0	MAN DAYS		
10302049		DESIGN & TEST PH CON SYSTEM COMPONENTS			400	22APR80	19NOV81
	1.00	TECHNOLOGY ENGINEERING	6.0	2400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	4.0	1600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	800.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	4.0	1600.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	800.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	800.0	MAN DAYS		
	4.70	TEST & CHECKOUT LAB	2.0	800.0	MAN DAYS		
10302059		BREADBOARD REF PHASE DISTR OPTIONS			400	12SEP80	21APR82
	1.00	TECHNOLOGY ENGINEERING	6.0	2400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	4.0	1600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	800.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	4.0	1600.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	800.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	800.0	MAN DAYS		
	4.70	TEST & CHECKOUT LAB	2.0	800.0	MAN DAYS		
10302069		DESIGN & BREADBOARD PH CON RECEIVERS			300	25MAR80	3JUN81
	1.00	TECHNOLOGY ENGINEERING	2.0	600.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	150.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	1.5	450.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	600.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS		
	4.00	MANUFACTURING	1.0	300.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	300.0	MAN DAYS		
10302079		TEST BASELINE & ALT ANTENNAS FOR BANDWIDTH			400	3JUN82	30JAN84
	1.00	TECHNOLOGY ENGINEERING	1.5	600.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	200.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	200.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	0.5	200.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.5	1000.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	0.5	230.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	0.5	200.0	MAN DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	200.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	0.5	200.0	MAN DAYS			
10302089		ANALYZE IONOSPHERE EFFECTS ON PH CON				1000	15JAN80	10JAN84
	1.00	TECHNOLOGY ENGINEERING	1.5	1500.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	1000.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	500.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	10.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	10.0	MACH DAY			
10304019		DESIGN FAB & TEST SUBSCALE SUBARRAYS				700	23MAR83	7JAN86
	1.00	TECHNOLOGY ENGINEERING	4.5	3150.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1400.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	350.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	1400.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	0.5	350.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	0.5	350.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.5	3150.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	700.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	350.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	700.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	1400.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	2100.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	700.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	2.0	1400.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	350.0	EQP DAYS			
	10.50	LARGE ANECHOIC CHAMBER	0.5	350.0	TESTDAYS			
10304028		TEST LOW-CTE APPROACHES FOR SUBARRAYS				150	15JAN80	13AUG80
	1.00	TECHNOLOGY ENGINEERING	2.5	375.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	150.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	75.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	150.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	75.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	75.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	150.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	150.0	MAN DAYS			
10304038		TEST FOR & ELIMINATE MULTIPACTOR PROBLEMS				300	22OCT82	10JAN84
	1.00	TECHNOLOGY ENGINEERING	2.5	750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	300.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	150.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	450.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	150.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	0.5	150.0	MAN DAYS			
	4.00	MANUFACTURING	0.5	150.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	150.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	150.0	EQP DAYS			
	10.20	SMALL COMB ENVIR CHAMBER	0.5	150.0	TESTDAYS			

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
10304048		DES TEST & EVAL LOW MASS/AREA TECH				300	22OCT82	10JAN84
	1.00	TECHNOLOGY ENGINEERING	2.5	750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	300.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	150.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	0.5	150.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	0.5	150.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	300.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	150.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	600.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	300.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	300.0	MAN DAYS			
10305019		ANALYZE TRANSIENT & EMI EFFECTS ON ANTENNA				400	12AUG84	16MAR85
	1.00	TECHNOLOGY ENGINEERING	3.5	1400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	800.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	0.5	200.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	0.5	200.0	MAN DAYS			
10305028		TEST & SIMULATE EMI EFFECTS				200	19OCT84	7AUG85
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	500.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	200.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	200.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	200.0	MAN DAYS			
10305038		ANALYZE SER-PARALLEL HOOKUP OF SSPA				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS			
10305048		TEST SERIES-PARALLEL HOOKUP OF SSPA				300	14AUG80	22OCT81
	1.00	TECHNOLOGY ENGINEERING	2.5	750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	150.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	300.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	750.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	4.00	MANUFACTURING	2.0	600.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	0.5	150.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.5	450.0	MAN DAYS		
10306018		ANALYZE & SIMULATE ANTENNA STRUC DYNAMICS			400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	2.2	900.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.8	300.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.5	600.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	0.4	150.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.4	150.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	3.0	EQP DAYS		
	10.10	LARGE SCALE COMPUTER	0.0	3.0	MACH DAY		
10307018		ANAL & SIM ANTENNA MECH AIMING & CONTROL			200	240CT80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	5.0	1000.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	400.0	MAN DAYS		
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	200.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	200.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	200.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	2.0	EQP DAYS		
	10.10	LARGE SCALE COMPUTER	0.0	2.0	MACH DAY		
10308019		ANALYZE BEAM SAFETY & DEFINE REQD SYSTEMS			400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	5.0	2000.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	3.0	1200.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	600.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS		
10309019		RESEARCH & ASSESS LASER XMSN OPTIONS			750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	3.5	2625.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	375.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	375.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	0.5	375.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	1500.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	750.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	375.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	375.0	MAN DAYS		
	4.00	MANUFACTURING	3.0	2250.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	750.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	750.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	750.0	MAN DAYS		
10309029		TEST P/V CONVERSION OF LASER LIGHT			400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	1.5	600.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	200.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	0.5	200.0	MAN DAYS		

ACTIVITY NODE=O/E	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	3.10	ENGR AIDES, DRAFTING	0.5	200.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	400.0	MAN DAYS			
10309039		TEST ALTERNATE RECONVERSION TECHNOLOGIES				600	15JAN80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	3.5	2100.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	300.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	300.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	300.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	600.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	300.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	1800.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	600.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	600.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	600.0	MAN DAYS			
10310019		ANALYZE RECTENNA OPTIONS				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	2.5	500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	100.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	100.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	200.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
10310029		TEST RECTENNA OPTIONS				500	4JUN80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	4.5	2250.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	500.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	1000.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.0	2000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.5	1250.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	500.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	0.5	250.0	MAN DAYS			
10401017		DEVEL & EMPLOY DETAILED STR DYN MODELS				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	5.0	2500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	2.0	1000.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	500.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	5.0	EQP DAYS			

ACTIVITY NODE=O/FE	DESCRIPTION RESOURCE	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	10.10 LARGE SCALE COMPUTER	0.0	5.0	MACH DAY		
10401327	ANALYZE LIGHTWEIGHT FLEX STRUCTURES			400	15JAN81	11AUG82
	1.00 TECHNOLOGY ENGINEERING	5.0	2000.0	MAN DAYS		
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	800.0	MAN DAYS		
	1.20 AERO/PERFORMANCE ENGINEERING	2.0	800.0	MAN DAYS		
	1.70 MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS		
	3.00 TECHNICAL SUPPORT	1.0	400.0	MAN DAYS		
	3.10 ENGR AIDES, DRAFTING	0.5	200.0	MAN DAYS		
	3.20 CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS		
	10.00 SPECIAL FACILITIES	0.0	4.0	EQP DAYS		
	10.10 LARGE SCALE COMPUTER	0.0	4.0	MACH DAY		
10402018	FAB & TEST REPRESENTATIVE STRUCT ITEMS			300	240CT80	13JAN82
	1.00 TECHNOLOGY ENGINEERING	1.0	300.0	MAN DAYS		
	1.10 MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS		
	3.00 TECHNICAL SUPPORT	1.2	360.0	MAN DAYS		
	3.10 ENGR AIDES, DRAFTING	0.5	150.0	MAN DAYS		
	3.20 CLERICAL, GRAPHICS	0.2	60.0	MAN DAYS		
	3.40 MECHANICAL LAB TECHS	0.5	150.0	MAN DAYS		
	4.00 MANUFACTURING	1.0	300.0	MAN DAYS		
	4.10 MECH/STRUCT DEV SHOP	1.0	300.0	MAN DAYS		
10403018	DES, ANAL, TEST JOINTS & FASTENERS			450	15JAN81	21OCT82
	1.00 TECHNOLOGY ENGINEERING	2.0	900.0	MAN DAYS		
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	900.0	MAN DAYS		
	3.00 TECHNICAL SUPPORT	2.5	1125.0	MAN DAYS		
	3.10 ENGR AIDES, DRAFTING	1.0	450.0	MAN DAYS		
	3.20 CLERICAL, GRAPHICS	0.5	225.0	MAN DAYS		
	3.40 MECHANICAL LAB TECHS	1.0	450.0	MAN DAYS		
	4.00 MANUFACTURING	2.0	900.0	MAN DAYS		
	4.10 MECH/STRUCT DEV SHOP	2.0	900.0	MAN DAYS		
10404016	DES, ANAL, TEST THERM PROT/CONTROL TECHNOLOGY			500	15JAN80	13JAN82
	1.00 TECHNOLOGY ENGINEERING	2.5	1250.0	MAN DAYS		
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS		
	1.60 PHYSICS TECHNOLOGY	0.5	250.0	MAN DAYS		
	3.00 TECHNICAL SUPPORT	1.5	750.0	MAN DAYS		
	3.10 ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS		
	3.40 MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS		
	4.00 MANUFACTURING	1.0	500.0	MAN DAYS		
	4.10 MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS		
10405017	ANALYZE & TEST STRUC PRODUCTION TECHNOLOGY			500	230CT81	21OCT83
	1.00 TECHNOLOGY ENGINEERING	3.5	1750.0	MAN DAYS		
	1.10 MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS		
	1.40 ELECTRONIC ENGINEERING	0.5	250.0	MAN DAYS		
	1.80 INDUST DESIGN & PLANT ENGR	2.0	1000.0	MAN DAYS		
	3.00 TECHNICAL SUPPORT	4.0	2000.0	MAN DAYS		
	3.10 ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS		
	3.20 CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS		
	3.40 MECHANICAL LAB TECHS	2.0	1000.0	MAN DAYS		

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	OUR	START	FINISH
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS		
	4.80	PROCESS PLANT SHOP	2.0	1000.0	MAN DAYS		
10501018		SURVEY & SELECT CANDIDATE MATERIALS			200	15JAN80	25OCT80
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS		
10501028		DEVELOP MATLS LIFE TESTING TECHNOLOGY			300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	2.0	600.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	300.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	300.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS		
	4.00	MANUFACTURING	0.5	150.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	0.5	150.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.2	60.0	EQP DAYS		
	10.20	SMALL COMB ENVIR CHAMBER	0.2	60.0	TESTDAYS		
10501038		LIFE TEST CANDIDATE MATERIALS			1000	24OCT80	18OCT84
	1.00	TECHNOLOGY ENGINEERING	3.0	3000.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	1000.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	2.0	2000.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	2000.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	2.0	2000.0	MAN DAYS		
	4.00	MANUFACTURING	0.5	500.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	0.5	500.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	2.0	2000.0	EQP DAYS		
	10.20	SMALL COMB ENVIR CHAMBER	2.0	2000.0	TESTDAYS		
10502019		TEST HI-TEMP COMPOSITES FOR LIFE & OUTGAS			700	15JAN80	21OCT82
	1.00	TECHNOLOGY ENGINEERING	7.0	4900.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1400.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	1400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	700.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	700.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	700.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	6.0	4200.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	700.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	700.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	2.0	1400.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	2.0	1400.0	MAN DAYS		
	4.00	MANUFACTURING	3.0	2100.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	700.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	700.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	700.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	2.0	1400.0	EQP DAYS		
	10.20	SMALL COMB ENVIR CHAMBER	2.0	1400.0	TESTDAYS		
10503018		DEVEL LOW-CTE WAVEGUIDE MATERIAL			350	15JAN80	3JUN81

ACTIVITY NODE=O/FE	DESCRIPTION RESOURCE		DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	2.5	875.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	350.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	350.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	175.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	700.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	175.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	175.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	175.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	0.5	175.0	MAN DAYS			
	4.00	MANUFACTURING	0.5	175.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	175.0	MAN DAYS			
10503027		DEVELOP OPTICS MATERIALS				350	15JAN80	3JUN81
	1.00	TECHNOLOGY ENGINEERING	2.0	700.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	350.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	350.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	525.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	175.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	175.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	175.0	MAN DAYS			
	4.00	MANUFACTURING	0.5	175.0	MAN DAYS			
	4.50	SPECIALTY SHOP	0.5	175.0	MAN DAYS			
10601017		REVIEW & DEVELOP FLT CONTROL THEORY				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	2.5	1250.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	2.0	1000.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.3	650.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.3	150.0	MAN DAYS			
10601027		DEVELOP ALGORITHMS & SOFTWARE APPROACH				700	14JAN82	18OCT84
	1.00	TECHNOLOGY ENGINEERING	4.0	2800.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	700.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	3.0	2100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.1	70.0	MAN DAYS			
	3.30	COMPUTER OPERATIONS	0.1	70.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	14.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	14.0	MACH DAY			
10602017		ANAL SENSOR REQTS & ASSESS TECHNOLOGY				200	24OCT80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	100.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	200.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.2	40.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.2	40.0	MAN DAYS			
10602027		CONDUCT SENSOR TEST PROGRAM				500	13AUG81	1*AUG83
	1.00	TECHNOLOGY ENGINEERING	2.0	1000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	500.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	3.00	TECHNICAL SUPPORT	2.0	1000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	500.0	MAN DAYS			
10603016		ANAL & DESIGN LARGE CMGS				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	3.5	700.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	100.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	300.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
10603026		CONDUCT WHEEL,BRNG,MOTOR RESEARCH				300	24OCT80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	2.0	600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	900.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	600.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	300.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	300.0	MAN DAYS			
10603036		ANALYZE & TEST OTHER ACTUATION TECHNOLOGIES				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	3.0	900.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	300.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	450.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	150.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	0.5	150.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	300.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	150.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	0.5	150.0	MAN DAYS			
10604017		DEVEL DATA MGMT HDWE & SFTWE APPROACH				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	4.5	900.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	400.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	100.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
10604027		DEVEL MAIN COMPUTER HDWE & SFTWE APPCH				400	4JUN80	13JAN82

ACTIVITY NODE=O/P	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	OUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	4.0	1600.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	900.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	800.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	400.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	200.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	4.0	EQP DAYS		
	10.10	LARGE SCALE COMPUTER	0.0	4.0	MACH DAY		
10604037		DEVEL & TEST ELECTRO-OPTIC DATA ACQUIS TECH			300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	600.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	300.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	3.5	1050.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	600.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	300.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	300.0	MAN DAYS		
10701017		CONTINUE DEVEL OF BEAM MACHINE TECH			500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	9.0	4500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	6.0	3000.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	500.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	1000.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	4.0	2000.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	1000.0	MAN DAYS		
	2.40	SYSTEMS TEST ENGR	2.0	1000.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	7.0	3500.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	2.0	1000.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	4.0	2000.0	MAN DAYS		
	4.00	MANUFACTURING	4.0	2000.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	4.0	2000.0	MAN DAYS		
10701027		DERIVE COMPREHENSIVE STRUCT DES REQTS			200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	1.0	200.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	3.0	600.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	2.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS		
10701037		ANAL, DES, TEST ALTERNATE FAB TECHNOLOGIES			400	24OCT80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	3.5	1400.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	1200.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	0.5	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	400.0	MAN DAYS		

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.5	1000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	200.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	400.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	400.0	MAN DAYS			
10702017		DEVEL MATLS & EQUIP HANDLING TECHNIQUES				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.5	1750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	0.5	250.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	500.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	5.0	2500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	500.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	3.0	1500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1500.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	1.0	500.0	MAN DAYS			
10703017		DES, ANAL, FAB, TEST INTEGRITY ASSUR METHODS				500	15JAN81	11JAN83
	1.00	TECHNOLOGY ENGINEERING	2.0	1000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	500.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	1000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
10704017		DEVEL & ANALYZE BERTHING TECHNOLOGIES				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	600.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	600.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	300.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	450.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	150.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN DAYS			
10705018		ANAL, SIMULATE, TEST SOLAR ARRAY DEPLOY				500	26MAR81	22MAR83
	1.00	TECHNOLOGY ENGINEERING	10.0	5000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	1500.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	500.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	1500.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.40	ELECTRONIC ENGINEERING	2.0	1000.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	500.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	7.0	3500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	500.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	3.0	1500.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	2.0	1000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	12.0	6000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTIN	3.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	1500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	3.0	1500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	1500.0	MAN DAYS			
	4.00	MANUFACTURING	7.0	3500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	3.0	1500.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	3.0	1500.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	1.0	500.0	MAN DAYS			
10706017		DEVELOP & TEST FLUIDS CHARGING TECHNOLOGY				500	15JAN81	11JAN83
	1.00	TECHNOLOGY ENGINEERING	2.0	1000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.5	750.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	1000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
10707015		DEVEL PLASTIC FILM REFLEC CONSTRUC TECH				500	13AUG81	11AUG83
	1.00	TECHNOLOGY ENGINEERING	1.0	500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.2	1100.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.2	100.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS			
10707018		DEVELOP CONDUCTOR DEPLOYMENT TECH				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.5	1750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.5	750.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	500.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	250.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	0.5	250.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	1000.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.5	1750.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	500.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	2.0	1000.0	MAN DAYS			
10709018		DEVEL SUBARRAY & EQUIP INSTL TECH				700	26MAR81	10JAN84
	1.00	TECHNOLOGY ENGINEERING	4.0	2800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1400.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	350.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	350.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	700.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	2800.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	700.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	700.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	2.0	1400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	2100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	700.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	700.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	700.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1400.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	2.0	1400.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	350.0	EQP DAYS			
	10.70	SYSTEMS INTEG LAB	0.5	350.0	OCC DAYS			
10710017		ANAL, DES, TEST BASE MOBILITY TECHNOLOGIES				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.5	1750.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	500.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	0.5	250.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	500.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
	4.00	MANUFACTURING	0.5	250.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	0.5	250.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.2	100.0	EQP DAYS			
	10.60	LARGE THERMAL/VAC CHAMBER	0.2	100.0	TESTDAYS			
10711017		ANALYZE SIMULATION REQTS & TRAINING NEEDS				500	14JAN82	10JAN84
	1.00	TECHNOLOGY ENGINEERING	1.2	600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	0.2	100.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	3.0	1500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	2.0	1000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	250.0	MAN DAYS			
10801017		ANAL & TEST ENGINE LIFE IMPROVEMENTS				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.0	1500.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	1500.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	3.00	TECHNICAL SUPPORT	3.0	1500.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	2.0	1000.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	1500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	3.0	1500.0	MAN DAYS			
10801027		RESEARCH METHANE COMBUST & HT XFER TECH				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	900.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	600.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	2.0	600.0	MAN DAYS			
	4.00	MANUFACTURING	3.0	900.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	3.0	900.0	MAN DAYS			
10801037		CONDUCT PHASE A BOOSTER ENGINE STUDY				230	4JUN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	4.0	800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	600.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	3.0	600.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	200.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS			
10802017		CONDUCT HLLV DESIGN & OPS STUDY				250	15JAN80	14JAN81
	1.00	TECHNOLOGY ENGINEERING	5.5	1375.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	750.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	250.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	125.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	250.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	1000.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	500.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	250.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	5.0	1250.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	500.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	2.0	500.0	MAN DAYS			
10802027		DES & TEST REUSABLE LH2 INSULATION				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	4.0	1600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	800.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	400.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	400.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	800.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	2.0	800.0	MAN DAYS			
10802037		DES & TEST IMPROVED RSI APPROACHES				500	15JAN80	13JAN82

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	OUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	3.0	1500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1000.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	500.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	500.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	750.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	250.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	1000.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	500.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	500.0	MAN DAYS		
10803017		DES ANAL & TEST IMPROVED ION THRUSTERS			600	15JAN80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	4.0	2400.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	600.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	600.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	600.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	600.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	3.0	1800.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	600.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	600.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	1.0	600.0	MAN DAYS		
	4.00	MANUFACTURING	3.0	1800.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	600.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	600.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	600.0	MAN DAYS		
10803027		RESEARCH MPD THRUSTERS			600	4JUN80	21OCT82
	1.00	TECHNOLOGY ENGINEERING	3.0	1800.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	600.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	300.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	0.5	300.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	600.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	0.5	300.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	0.5	300.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	900.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	0.5	300.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	0.5	300.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	0.5	300.0	MAN DAYS		
	4.00	MANUFACTURING	1.5	900.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	0.5	300.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	0.5	300.0	MAN DAYS		
	4.50	SPECIALTY SHOP	0.5	300.0	MAN DAYS		
10803037		DEVELOP 6-DOF LOW THRUST GN&C ALGORITHMS			600	15JAN80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	4.0	2400.0	MAN DAYS		
	1.20	AERO/PERFORMANCE ENGINEERING	2.0	1200.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	1200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	600.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	600.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	12.0	EQP DAYS		
	10.10	LARGE SCALE COMPUYER	0.0	12.0	MACH DAY		

ACTIVITY NODE=O/FE	DESCRIPTION RESOURCE	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
10803048	EXTEND SOLAR CELL DEGRAD TESTS TO EOTV				500	26MAR81	22MAR83
	1.00 TECHNOLOGY ENGINEERING	4.0	2000.0	MAN DAYS			
	1.30 ELECTRIC POWER ENGINEERING	2.0	1000.0	MAN DAYS			
	1.60 PHYSICS TECHNOLOGY	2.0	1000.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	3.0	1500.0	MAN DAYS			
	3.20 CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
	3.50 ELECTRICAL LAB TECHS	2.0	1000.0	MAN DAYS			
	4.00 MANUFACTURING	1.0	500.0	MAN DAYS			
	4.50 SPECIALTY SHOP	1.0	500.0	MAN DAYS			
	10.00 SPECIAL FACILITIES	0.5	250.0	EQP DAYS			
	10.30 LARGE COMB ENVIR CHAMBER	0.5	250.0	TESTDAYS			
10804016	CONDUCT FEASIBILITY TESTS OF LASER THRUSTERS				400	15JAN80	12AUG81
	1.00 TECHNOLOGY ENGINEERING	10.5	4200.0	MAN DAYS			
	1.20 AERO/PERFORMANCE ENGINEERING	3.0	1200.0	MAN DAYS			
	1.30 ELECTRIC POWER ENGINEERING	1.5	600.0	MAN DAYS			
	1.40 ELECTRONIC ENGINEERING	1.5	600.0	MAN DAYS			
	1.50 CHEMICAL/PROCESS ENGINEERING	1.5	600.0	MAN DAYS			
	1.60 PHYSICS TECHNOLOGY	3.0	1200.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	4.5	1800.0	MAN DAYS			
	3.10 ENGR AIDES, DRAFTING	1.5	600.0	MAN DAYS			
	3.40 MECHANICAL LAB TECHS	1.5	600.0	MAN DAYS			
	3.50 ELECTRICAL LAB TECHS	1.5	600.0	MAN DAYS			
	4.00 MANUFACTURING	4.5	1800.0	MAN DAYS			
	4.10 MECH/STRUCT DEV SHOP	1.5	600.0	MAN DAYS			
	4.20 ELEC/ELECTRONIC DEV SHOP	1.5	600.0	MAN DAYS			
	4.50 SPECIALTY SHOP	1.5	600.0	MAN DAYS			
10805015	CONDUCT INTEG DES & OPS STUDY OF SPACE BASING				200	15JAN80	23OCT80
	1.00 TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	2.0	400.0	MAN DAYS			
	2.00 PROJECT ENGINEERING	5.0	1000.0	MAN DAYS			
	2.10 SYS ANALYSIS/CONFIG ENGR	2.0	400.0	MAN DAYS			
	2.20 REQTS & SYS DEFINITION	1.0	200.0	MAN DAYS			
	2.50 SYSTEMS MANAGEMENT	1.0	200.0	MAN DAYS			
	2.60 HUMAN FACTORS & SIM ENGR	1.0	200.0	MAN DAYS			
	3.00 TECHNICAL SUPPORT	3.5	700.0	MAN DAYS			
	3.10 ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS			
	3.20 CLERICAL, GRAPHICS	2.0	400.0	MAN DAYS			
	3.40 MECHANICAL LAB TECHS	0.5	100.0	MAN DAYS			
10806017	ANALYZE SEA-BASED LAUNCH SITE				350	15JAN80	3JUN81
	1.00 TECHNOLOGY ENGINEERING	5.0	1750.0	MAN DAYS			
	1.10 MECHANICAL/STRUCT ENGINEERING	1.0	350.0	MAN DAYS			
	1.20 AERO/PERFORMANCE ENGINEERING	0.5	175.0	MAN DAYS			
	1.30 ELECTRIC POWER ENGINEERING	1.0	350.0	MAN DAYS			
	1.40 ELECTRONIC ENGINEERING	0.5	175.0	MAN DAYS			
	1.80 INDUST DESIGN & PLANT ENGR	1.0	350.0	MAN DAYS			
	1.90 CIVIL & FACILITIES ENGINEERING	1.0	350.0	MAN DAYS			
	2.00 PROJECT ENGINEERING	5.0	1750.0	MAN DAYS			
	2.10 SYS ANALYSIS/CONFIG ENGR	2.0	700.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	OUR	START	FINISH
	2.20	REQTS & SYS DEFINITION	1.0	350.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	350.0	MAN DAYS		
	2.60	HUMAN FACTORS & SIM ENGR	1.0	350.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	700.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	350.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	350.0	MAN DAYS		
18901017		FAB & TEST SAMPLES OF SHEET COND WITH COATINGS			500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.0	1500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	500.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	500.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	1000.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	500.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	500.0	MAN DAYS		
10901028		ANAL & TEST CONDUCTOR STRUCT SUPPORT			300	14JAN82	22MAR83
	1.00	TECHNOLOGY ENGINEERING	4.0	1200.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	600.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	300.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	300.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	600.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	300.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	1.0	300.0	MAN DAYS		
	4.00	MANUFACTURING	1.0	300.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	300.0	MAN DAYS		
10902018		DEVEL & EMPLOY DETAILED TRANSIENT ANAL MODELS			500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	7.0	3500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	500.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	3.0	1500.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	500.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	1000.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	2.0	1000.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	500.0	MAN DAYS		
10903018		DES ANAL & TEST HV INSULATORS & STANDOFFS			350	4JUN80	22OCT81
	1.00	TECHNOLOGY ENGINEERING	4.0	1400.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	350.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	700.0	MAN DAYS		
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	350.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	350.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	1.0	350.0	MAN DAYS		
	4.00	MANUFACTURING	2.0	700.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	350.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	350.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.5	175.0	EQP DAYS		
	10.20	SMALL COMB ENVIR CHAMBER	0.5	175.0	TESTDAYS		
16904018		IDENTIFY ANAL & TEST INSULATION MATLS			700	15JAN80	21OCT82
	1.00	TECHNOLOGY ENGINEERING	2.0	1400.0	MAN DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	700.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	350.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	0.5	350.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	700.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	0.5	350.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	0.5	350.0	MAN DAYS			
	4.00	MANUFACTURING	0.5	350.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	0.5	350.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	350.0	EQP DAYS			
	10.20	SMALL COMB ENVIR CHAMBER	0.5	350.0	TESTDAYS			
18905018		DESIGN LIGHTWEIGHT LIQ COOL XFORMERS				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	3.5	700.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
18905028		TEST LIGHTWEIGHT LIQUID COOLED TRANSFORMERS				450	24OCT80	11AUG82
	1.00	TECHNOLOGY ENGINEERING	2.0	900.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	450.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	450.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1350.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	450.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	450.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	450.0	MAN DAYS			
	4.00	MANUFACTURING	1.0	450.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	450.0	MAN DAYS			
18905038		PERFORM SUBSYS DES STUDY OF PWR PROCESSORS				200	4JUN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	4.0	800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
18905048		PERFORM DESIGN STUDY OF SPLIT PROC & AC DISTR				200	24OCT80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	3.5	700.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
18906018		DESIGN & ANALYZE CIRCUIT BREAKERS				200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	4.0	800.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		OUR	START	FINISH
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	0.5	100.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
10906028		FAB & TEST PROMISING CKT BRKR DESIGNS				400	240CT80	2JUN82
	1.00	TECHNOLOGY ENGINEERING	7.5	3000.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	800.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	4.0	1600.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	400.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	0.5	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	1600.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	400.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	2.0	800.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	5.0	2000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	2.0	800.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	2.0	800.0	MAN DAYS			
	4.00	MANUFACTURING	6.0	2400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	2.0	800.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	4.0	1600.0	MAN DAYS			
10907018		ANAL & SIMULATE EMI & MOD PWR SYS DESIGNS				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	6.0	2400.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	800.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	800.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	800.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	800.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN DAYS			
10908018		LIFE & VAC TEST HV SLIPRING TECH				800	15JAN80	22MAR83
	1.00	TECHNOLOGY ENGINEERING	4.0	3200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	800.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	1600.0	MAN DAYS			
	1.50	CHEMICAL/PROCESS ENGINEERING	1.0	800.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	800.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	800.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	1600.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	800.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	800.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	400.0	EQP DAYS			
	10.20	SMALL COMB ENVIR CHAMBER	0.5	400.0	TESTDAYS			
11801019		REVIEW & ANAL S/C CHARGING EFFECTS				500	15JAN80	13JAN82
	1.00	TECHNOLOGY ENGINEERING	3.5	1750.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	250.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1000.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.70	MATH & SOFTWARE ENGINEERING	1.0	500.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	500.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	500.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	500.0	MAN DAYS			
11001029		CONDUCT CHAMBER TESTS OF S/C CHARGING				200	14JAN82	21OCT82
	1.00	TECHNOLOGY ENGINEERING	3.0	600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	200.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	600.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	1.0	200.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	1.0	200.0	MAN DAYS			
	4.00	MANUFACTURING	2.0	400.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	1.0	200.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	200.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.5	100.0	EQP DAYS			
	10.30	LARGE COMB ENVIR CHAMBER	0.5	100.0	TESTDAYS			
11003018		ANALYZE MAGNETIC FIELD & TORQUE EFFECTS				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	3.5	1050.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	150.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	300.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN DAYS			
11004019		ANALYZE SPACE PLASMA EFFECTS				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	3.5	1050.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	150.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	300.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN DAYS			
11004029		CONDUCT ANALYTICAL ASSESSMT OF THRUSTER EFFECTS				750	26MAR81	20MAR84
	1.00	TECHNOLOGY ENGINEERING	3.5	2625.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	375.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	1500.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	750.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	750.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	750.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	750.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	750.0	MAN DAYS			
11101018		CONDUCT SILICON TECHNOLOGY ASSESSMENT				60	28MAY85	21AUG85

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	1.0	60.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	60.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	240.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN DAYS			
11101028		CONDUCT GALLIUM TECHNOLOGY ASSESSMENT				60	28MAY85	21AUG85
	1.00	TECHNOLOGY ENGINEERING	1.0	60.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	60.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	240.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN DAYS			
11101030		EVAL & ASSESS BENEFITS & TECH READINESS				60	28MAY85	21AUG85
	1.00	TECHNOLOGY ENGINEERING	1.0	60.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	60.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	240.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN DAYS			
11102015		DESIGN & SYS ANALYSIS OF THERMAL ENGINE SPSS				300	15JAN80	25MAR81
	1.00	TECHNOLOGY ENGINEERING	2.0	600.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	300.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	300.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	450.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	150.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	3.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	3.0	MACH DAY			
11102028		THERMAL ENGINE ASSESSMENT				100	10AUG84	7JAN85
	1.00	TECHNOLOGY ENGINEERING	2.0	200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	100.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	100.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	100.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	100.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	150.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	50.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	1.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	1.0	MACH DAY			
11102038		THERMAL/FLUID SYSTEMS OVERALL ASSESSMENT				150	8JAN85	7AUG85
	1.00	TECHNOLOGY ENGINEERING	2.0	300.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	150.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	150.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	150.0	MAN DAYS			

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	150.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.5	225.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	150.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	75.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	1.5	EQP DAYS		
	10.10	LARGE SCALE COMPUTER	0.0	1.5	MACH DAY		
11103019		EVALUATE POWER XMSN TECH IN SYS STUDIES			750	23MAR83	18MAR86
	1.00	TECHNOLOGY ENGINEERING	7.0	5250.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	1500.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	1500.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	3.0	2250.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	2.0	1500.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	1500.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	1500.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	750.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	750.0	MAN DAYS		
11103029		ASSESS & COMPARE POWER XMSN TECH			60	8JAN86	1APR86
	1.00	TECHNOLOGY ENGINEERING	7.0	420.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	120.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	120.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	3.0	180.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	2.0	120.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	120.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	60.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	60.0	MAN DAYS		
11103038		TRADE OFF MPTS EFF, MASS, RELIAB, ETC			200	12JAN83	21OCT83
	1.00	TECHNOLOGY ENGINEERING	4.0	800.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	3.0	600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	4.0	800.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	400.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	2.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	400.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS		
11104018		ASSESS STRUCTURES TECNOLOGY			60	24OCT83	20JAN84
	1.00	TECHNOLOGY ENGINEERING	1.0	60.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	60.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	3.0	180.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	0.5	30.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	0.5	30.0	MAN DAYS		
11104028		PERFORM DETAILED STRUC DESIGN & TRADEOFF			250	15JAN80	14JAN81
	1.00	TECHNOLOGY ENGINEERING	2.0	500.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	500.0	MAN DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	2.00	PROJECT ENGINEERING	1.0	250.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	250.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.5	375.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	250.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	125.0	MAN DAYS			
11104038		ANAL & EVAL ALTERNATE MECH/ELEC ROTARY JOINTS				200	24OCT80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	400.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	400.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENG	2.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS			
11105018		SET DESIGN ALLOWABLES & OTHER CRITERIA				100	11JAN84	29MAY84
	1.00	TECHNOLOGY ENGINEERING	2.0	200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	200.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	100.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	100.0	MAN DAYS			
11105028		ASSESS MATERIALS TECHNOLOGIES				200	8JAN85	17OCT85
	1.00	TECHNOLOGY ENGINEERING	1.0	200.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	400.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	0.5	100.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	0.5	100.0	MAN DAYS			
11106018		ANALYZE APPLICATION OF FLT CON TECH TO SYSTEM				200	26MAR81	13JAN82
	1.00	TECHNOLOGY ENGINEERING	1.0	200.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	3.0	600.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	200.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	200.0	MAN DAYS			
11106028		ASSESS FLIGHT CONTROL TECHNOLOGIES				60	22OCT82	25JAN83
	1.00	TECHNOLOGY ENGINEERING	1.0	60.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	60.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	3.0	180.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	60.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN DAYS			
11106038		ANALYZE & ASSESS DATA MGMT TECHNOLOGIES				200	14JAN82	21OCT82
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	200.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	400.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS			

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	2.50	SYSTEMS MANAGEMENT	1.0	200.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS			
11106048		PERF INTEG STRUCT/CONTROLS/DATA STUDY				350	24OCT80	24MAR82
	1.00	TECHNOLOGY ENGINEERING	8.0	2800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	700.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	2.0	700.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	700.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	700.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	1.0	350.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	350.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1050.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	2.0	700.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	350.0	MAN DAYS			
11107018		PERFORM SPACE CONSTR SYSTEMS ANALYSES & EVAL				200	31MAY84	18MAR85
	1.00	TECHNOLOGY ENGINEERING	2.0	400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	1.0	200.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	2.0	400.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	400.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS			
11107018		CONDUCT INTEGRATED SPACE CONSTRUCTION ANAL				350	3JUN82	21OCT83
	1.00	TECHNOLOGY ENGINEERING	3.0	1050.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	700.0	MAN DAYS			
	1.80	INDUST DESIGN & PLANT ENGR	1.0	350.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	5.0	1750.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	700.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	350.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	2.0	700.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	2.0	700.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	350.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	1.0	350.0	MAN DAYS			
11108018		CONDUCT INTEGRATED SPACE TRANSPORT ANALYSIS				350	23MAR83	9AUG84
	1.00	TECHNOLOGY ENGINEERING	5.5	1925.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	1050.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	350.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	0.5	175.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	1.0	350.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	1400.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	700.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	1.0	350.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	1.0	350.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	3.0	1050.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	350.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	700.0	MAN DAYS			
11108028		CONDUCT SPACE TRANSPORT TECHNOLOGY & DESIGN ASSE				60	10AUG84	1NOV84

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.00	TECHNOLOGY ENGINEERING	5.5	330.0	MAN	DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	180.0	MAN	DAYS		
	1.20	AERO/PERFORMANCE ENGINEERING	1.0	60.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	30.0	MAN	DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	60.0	MAN	DAYS		
	2.00	PROJECT ENGINEERING	4.0	240.0	MAN	DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN	DAYS		
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN	DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	3.0	180.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	60.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	2.0	120.0	MAN	DAYS		
11109018		CONDUCT INTEGRATED DESIGN OF PWR PROC & DISTR				250	23MAR83	20MAR84
	1.00	TECHNOLOGY ENGINEERING	5.0	1250.0	MAN	DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	500.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	500.0	MAN	DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	250.0	MAN	DAYS		
	2.00	PROJECT ENGINEERING	4.0	1000.0	MAN	DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	500.0	MAN	DAYS		
	2.20	REQTS & SYS DEFINITION	1.0	250.0	MAN	DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	250.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	2.0	500.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	250.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	250.0	MAN	DAYS		
11109028		ASSESS POWER PROC & DISTR TECHNOLOGIES				60	21MAR84	13JUN84
	1.00	TECHNOLOGY ENGINEERING	5.0	300.0	MAN	DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	120.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	120.0	MAN	DAYS		
	1.40	ELECTRONIC ENGINEERING	1.0	60.0	MAN	DAYS		
	2.00	PROJECT ENGINEERING	4.0	240.0	MAN	DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	120.0	MAN	DAYS		
	2.20	REQTS & SYS DEFINITION	1.0	60.0	MAN	DAYS		
	2.50	SYSTEMS MANAGEMENT	1.0	60.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	2.0	120.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	60.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	60.0	MAN	DAYS		
111 9038		CONDUCT INTEGRATED POWER SYS TRANS ANAL				300	14JAN82	22MAR83
	1.00	TECHNOLOGY ENGINEERING	5.0	1500.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	600.0	MAN	DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	300.0	MAN	DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	600.0	MAN	DAYS		
	2.00	PROJECT ENGINEERING	1.0	300.0	MAN	DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	300.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	2.0	600.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	300.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	300.0	MAN	DAYS		
11118019		ANALYZE SPACE ENVIR EFFECTS ON SPS DES				200	21MAR84	7JAN85
	1.00	TECHNOLOGY ENGINEERING	3.5	700.0	MAN	DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	1.30	ELECTRIC POWER ENGINEERING	0.5	100.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	400.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	200.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	200.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS		
11110029		ASSESS SEVERITY OF SPACE ENVIR EFFECTS			60	6JAN85	1APR85
	1.00	TECHNOLOGY ENGINEERING	3.5	210.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	30.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	120.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	60.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	60.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	60.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	1.0	60.0	MAN DAI		
	3.20	CLERICAL, GRAPHICS	1.0	60.0	MAN DAYS		
11111018		MAINTAIN & UPDATE REF & ALT DES IN SYS STUDIES			400	15JAN80	7AUG85
	1.00	TECHNOLOGY ENGINEERING	4.5	6300.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	2800.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	700.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	2800.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	6.0	8400.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	2800.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	2.0	2800.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	2.0	2800.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	2800.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	1400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	1400.0	MAN DAYS		
11111028		ANALYZE SPS STARTUP & SHUTDOWN TRANSIENTS			200	15JAN80	23OCT80
	1.00	TECHNOLOGY ENGINEERING	5.0	1000.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	1.0	200.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	400.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	1.0	200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	1.0	200.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	400.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	200.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	200.0	MAN DAYS		
11111038		ANALYZE & EVAL SPS DEVEL FLIGHT PROJECTS			250	4JUN80	3JUN81
	1.00	TECHNOLOGY ENGINEERING	4.5	1125.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	500.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	0.5	125.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	500.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	6.0	1500.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	500.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	2.0	500.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	2.0	500.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	2.0	500.0	MAN DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	3.10	ENGR AIDES, DRAFTING	1.0	250.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	250.0	MAN DAYS		
20302019		CONDUCT LAPATS PHASE B STUDY			200	19AUG80	4JUN81
	1.00	TECHNOLOGY ENGINEERING	8.0	1600.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	400.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	400.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	2.0	400.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	6.0	1200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	400.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	2.0	400.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	2.0	400.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	4.0	800.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	2.0	400.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	2.0	400.0	MAN DAYS		
20302020		DESIGN LG APER PH CON TECH SATELLITE			375	27AUG81	1MAR83
	1.00	TECHNOLOGY ENGINEERING	54.0	20250.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	15.0	5625.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	4.0	1500.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	25.0	9375.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	5.0	1875.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	5.0	1875.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	44.0	16500.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	10.0	3750.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	12.0	4500.0	MAN DAYS		
	2.30	CONFIGURATION MGMT	12.0	4500.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	10.0	3750.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	19.0	7125.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	10.0	3750.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	7.0	2625.0	MAN DAYS		
	3.30	COMPUTER OPERATIONS	2.0	750.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	0.0	7.5	EQP DAYS		
	10.10	LARGE SCALE COMPUTER	0.0	7.5	MACH DAY		
20302030		FABRICA . LG APER PH CON TECH SAT			300	5NOV82	24JAN84
	1.00	TECHNOLOGY ENGINEERING	22.0	6600.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	9.0	2700.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	10.0	3000.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	29.0	8700.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	5.0	1500.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	9.0	2700.0	MAN DAYS		
	2.30	CONFIGURATION MGMT	5.0	1500.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	10.0	3000.0	MAN DAYS		
	4.00	MANUFACTURING	119.0	35700.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	4.0	1200.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	5.0	1500.0	MAN DAYS		
	4.30	MECH/STRUCT PRODUCTION SHOP	40.0	12000.0	MAN DAYS		
	4.40	ELEC/ELECTRONIC PRODUCTION SHOP	40.0	12000.0	MAN DAYS		
	4.50	SPECIALTY SHOP	10.0	3000.0	MAN DAYS		

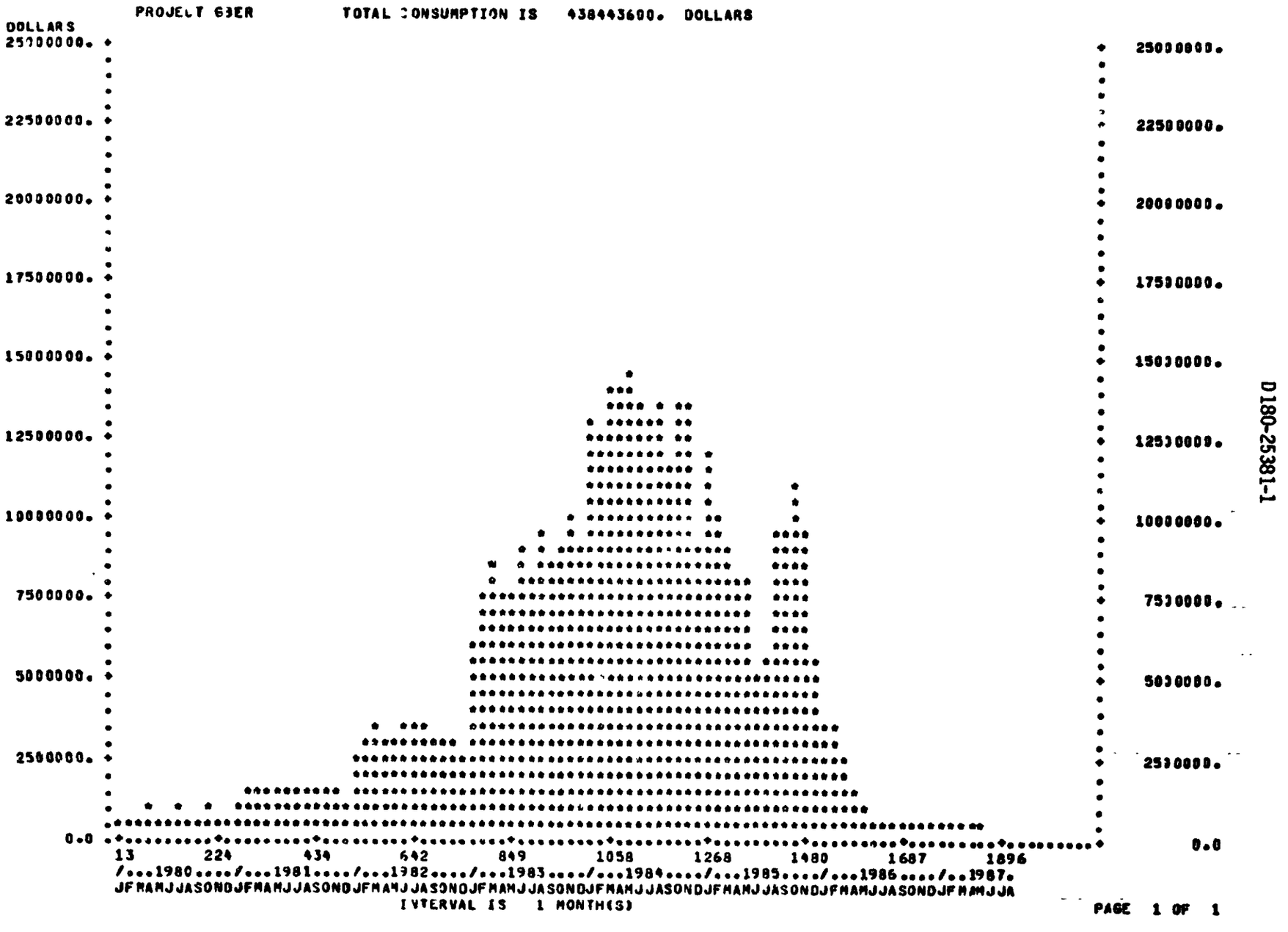
ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	4.60	FINAL ASSEMBLY SHOP	20.0	6000.0	MAN DAYS			
20302048		TEST & C/O LG APER PH CON TECH SAT				200	16JUN83	5APR84
	1.00	TECHNOLOGY ENGINEERING	17.0	3400.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	5.0	1000.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	400.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	9.0	1800.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	1.0	200.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	20.0	4000.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	6.0	1200.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	4.0	800.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	10.0	2000.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	40.0	8000.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	7.0	1400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	10.0	2000.0	MAN DAYS			
	3.30	COMPUTER OPERATIONS	1.0	200.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	7.0	1400.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	15.0	3000.0	MAN DAYS			
	4.00	MANUFACTURING	42.0	8400.0	MAN DAYS			
	4.30	MECH/STRUCT PRODUCTION SHOP	10.0	2000.0	MAN DAYS			
	4.40	ELEC/ELECTRONIC PRODUCTION SHOP	10.0	2000.0	MAN DAYS			
	4.50	SPECIALTY SHOP	2.0	400.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	20.0	4000.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.3	52.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	2.0	MACH DAY			
	10.60	LARGE THERMAL/VAC CHAMBER	0.3	50.0	TESTDAYS			
20302058		LAUNCH LG APER PH CON TECH SAT				90	4APR84	9AUG84
	1.00	TECHNOLOGY ENGINEERING	6.0	540.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	2.0	180.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	2.0	180.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	180.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	360.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	2.0	180.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	2.0	180.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	15.0	1350.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	3.0	270.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	180.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	5.0	450.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	5.0	450.0	MAN DAYS			
	4.00	MANUFACTURING	10.0	900.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	10.0	900.0	MAN DAYS			
	5.00	CONSTRUCTION & FIELD OPS	10.0	900.0	MAN DAYS			
	5.40	LAUNCH & MISSION OPS	10.0	900.0	MAN DAYS			
20302068		OPERATE & EVALUEATE LAPATS RESULTS				400	16AUG84	15MAR86
	1.00	TECHNOLOGY ENGINEERING	7.0	2800.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	4.0	1600.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	800.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	4.0	1600.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	800.0	MAN DAYS			

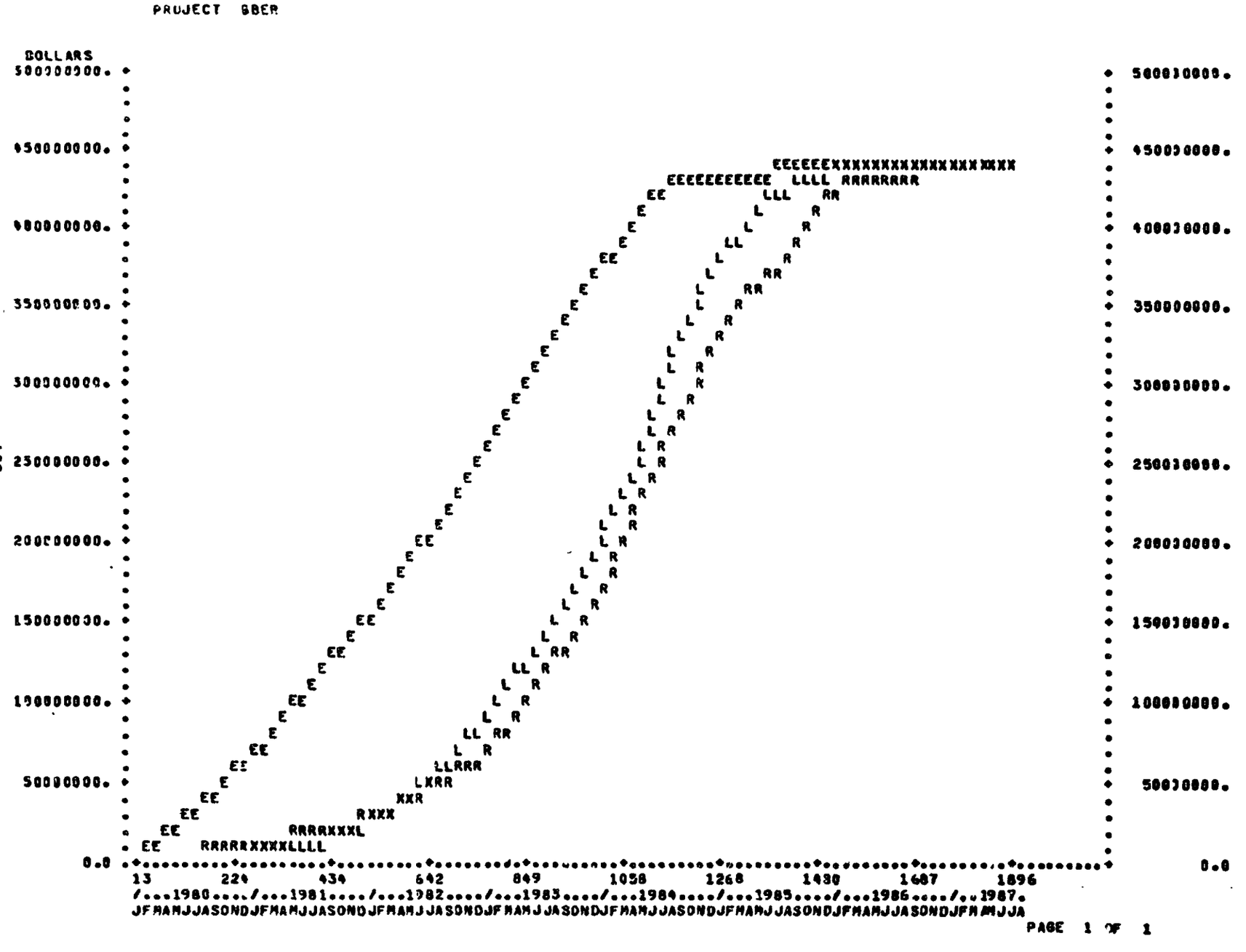
ACTIVITY NODE=O/PE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	2.50	SYSTEMS MANAGEMENT	2.0	800.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	4.0	1600.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	2.0	800.0	MAN DAYS			
	3.30	COMPUTER OPERATIONS	1.0	400.0	MAN DAYS			
	5.00	CONSTRUCTION & FIELD OPS	5.0	2000.0	MAN DAYS			
	5.40	LAUNCH & MISSION OPS	5.0	2000.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	0.0	8.0	EQP DAYS			
	10.10	LARGE SCALE COMPUTER	0.0	8.0	MACH DAY			
20701017		CONDUCT SHUTTLE SORTIE BEAM MACHINE TEST				300	14JAN82	22MAR83
	1.00	TECHNOLOGY ENGINEERING	16.0	4800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	5.0	1500.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	3.0	900.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	3.0	900.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	600.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	17.0	5100.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	600.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	3.0	900.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	3.0	900.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	5.0	1500.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	2.0	600.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	2.0	600.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	14.0	4200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	5.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	900.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	3.0	900.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	900.0	MAN DAYS			
	4.00	MANUFACTURING	35.0	10500.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	10.0	3000.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	10.0	3000.0	MAN DAYS			
	4.50	SPECIALTY SHOP	5.0	1500.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	10.0	3000.0	MAN DAYS			
	5.00	CONSTRUCTION & FIELD OPS	10.0	3000.0	MAN DAYS			
	5.40	LAUNCH & MISSION OPS	10.0	3000.0	MAN DAYS			
	10.00	SPECIAL FACILITIES	1.0	300.0	EQP DAYS			
	10.60	LARGE THERMAL/VAC CHAMBER	0.5	150.0	TESTDAYS			
	10.70	SYSTEMS INTEG LAB	0.5	150.0	OCC DAYS			
20705017		FLIGHT TEST SOLAR ARRAY DEPLOYMENT				300	23MAR83	29MAY84
	1.00	TECHNOLOGY ENGINEERING	16.0	4800.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	5.0	1500.0	MAN DAYS			
	1.20	AERO/PERFORMANCE ENGINEERING	3.0	900.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	3.0	900.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	2.0	600.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	17.0	5100.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	600.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	3.0	900.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	3.0	900.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	5.0	1500.0	MAN DAYS			

ACTIVITY MODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE	DUR	START	FINISH
	2.50	SYSTEMS MANAGEMENT	2.0	600.0	MAN DAYS		
	2.60	HUMAN FACTORS & SIM ENGR	2.0	600.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	14.0	4200.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	5.0	1500.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	3.0	900.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	3.0	900.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	3.0	900.0	MAN DAYS		
	4.00	MANUFACTURING	35.0	10500.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	10.0	3000.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	10.0	3000.0	MAN DAYS		
	4.50	SPECIALTY SHOP	5.0	1500.0	MAN DAYS		
	4.70	TEST & CHECKOUT LAB	10.0	3000.0	MAN DAYS		
	5.00	CONSTRUCTION & FIELD OPS	10.0	3000.0	MAN DAYS		
	5.40	LAUNCH & MISSION OPS	10.0	3000.0	MAN DAYS		
	10.00	SPECIAL FACILITIES	1.0	300.0	EQP DAYS		
	10.60	LARGE THERMAL/VAC CHAMBER	0.5	150.0	TESTDAYS		
	10.70	SYSTEMS INTEG LAB	0.5	150.0	OCC DAYS		
21051019		COND SORTIE TEST OF S/C CHG & PLASMA EFF			300	220CT82	10JAN84
	1.00	TECHNOLOGY ENGINEERING	11.0	3300.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	900.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	600.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS		
	2.00	PROJECT ENGINEERING	14.0	4200.0	MAN DAYS		
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	600.0	MAN DAYS		
	2.20	REQTS & SYS DEFINITION	3.0	900.0	MAN DAYS		
	2.30	CONFIGURATION MGMT	3.0	900.0	MAN DAYS		
	2.40	SYSTEMS TEST ENGR	3.0	900.0	MAN DAYS		
	2.50	SYSTEMS MANAGEMENT	2.0	600.0	MAN DAYS		
	2.60	HUMAN FACTORS & SIM ENGR	1.0	300.0	MAN DAYS		
	3.00	TECHNICAL SUPPORT	14.0	4200.0	MAN DAYS		
	3.10	ENGR AIDES, DRAFTING	5.0	1500.0	MAN DAYS		
	3.20	CLERICAL, GRAPHICS	3.0	900.0	MAN DAYS		
	3.40	MECHANICAL LAB TECHS	3.0	900.0	MAN DAYS		
	3.50	ELECTRICAL LAB TECHS	3.0	900.0	MAN DAYS		
	4.00	MANUFACTURING	11.0	3300.0	MAN DAYS		
	4.10	MECH/STRUCT DEV SHOP	2.0	600.0	MAN DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	5.0	1500.0	MAN DAYS		
	4.50	SPECIALTY SHOP	1.0	300.0	MAN DAYS		
	4.70	TEST & CHECKOUT LAB	3.0	900.0	MAN DAYS		
	5.00	CONSTRUCTION & FIELD OPS	10.0	3000.0	MAN DAYS		
	5.40	LAUNCH & MISSION OPS	10.0	3000.0	MAN DAYS		
21052019		COND SORTIE TEST OF HV BREAKDOWN EFFECTS			300	7DEC82	21FEB84
	1.00	TECHNOLOGY ENGINEERING	11.0	3300.0	MAN DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	900.0	MAN DAYS		
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS		
	1.40	ELECTRONIC ENGINEERING	2.0	600.0	MAN DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS		

ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	2.00	PROJECT ENGINEERING	14.0	4200.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	600.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	3.0	900.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	3.0	900.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	3.0	900.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	2.0	600.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	14.0	4200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	5.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	900.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	3.0	900.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	900.0	MAN DAYS			
	4.00	MANUFACTURING	11.0	3300.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	2.0	600.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	5.0	1500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	300.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	3.0	900.0	MAN DAYS			
	5.00	CONSTRUCTION & FIELD OPS	10.0	3000.0	MAN DAYS			
	5.40	LAUNCH & MISSION OPS	10.0	3000.0	MAN DAYS			
21004019		CONDUCT SORTIE FLT WITH ION THRUSTER				300	7DEC82	21FEB84
	1.00	TECHNOLOGY ENGINEERING	11.0	3300.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	3.0	900.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	3.0	900.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	2.0	600.0	MAN DAYS			
	1.60	PHYSICS TECHNOLOGY	2.0	600.0	MAN DAYS			
	1.70	MATH & SOFTWARE ENGINEERING	1.0	300.0	MAN DAYS			
	2.00	PROJECT ENGINEERING	14.0	4200.0	MAN DAYS			
	2.10	SYS ANALYSIS/CONFIG ENGR	2.0	600.0	MAN DAYS			
	2.20	REQTS & SYS DEFINITION	3.0	900.0	MAN DAYS			
	2.30	CONFIGURATION MGMT	3.0	900.0	MAN DAYS			
	2.40	SYSTEMS TEST ENGR	3.0	900.0	MAN DAYS			
	2.50	SYSTEMS MANAGEMENT	2.0	600.0	MAN DAYS			
	2.60	HUMAN FACTORS & SIM ENGR	1.0	300.0	MAN DAYS			
	3.00	TECHNICAL SUPPORT	14.0	4200.0	MAN DAYS			
	3.10	ENGR AIDES, DRAFTING	5.0	1500.0	MAN DAYS			
	3.20	CLERICAL, GRAPHICS	3.0	900.0	MAN DAYS			
	3.40	MECHANICAL LAB TECHS	3.0	900.0	MAN DAYS			
	3.50	ELECTRICAL LAB TECHS	3.0	900.0	MAN DAYS			
	4.00	MANUFACTURING	11.0	3300.0	MAN DAYS			
	4.10	MECH/STRUCT DEV SHOP	2.0	600.0	MAN DAYS			
	4.20	ELEC/ELECTRONIC DEV SHOP	5.0	1500.0	MAN DAYS			
	4.50	SPECIALTY SHOP	1.0	300.0	MAN DAYS			
	4.70	TEST & CHECKOUT LAB	3.0	900.0	MAN DAYS			
	5.00	CONSTRUCTION & FIELD OPS	10.0	3000.0	MAN DAYS			
	5.40	LAUNCH & MISSION OPS	10.0	3000.0	MAN DAYS			
30303019		CONTINUE & EXTEND IONOSPH HEATING PROG				750	15JAN80	11JAN83
	1.00	TECHNOLOGY ENGINEERING	7.5	5625.0	MAN DAYS			
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	375.0	MAN DAYS			
	1.30	ELECTRIC POWER ENGINEERING	1.0	750.0	MAN DAYS			
	1.40	ELECTRONIC ENGINEERING	3.0	2250.0	MAN DAYS			

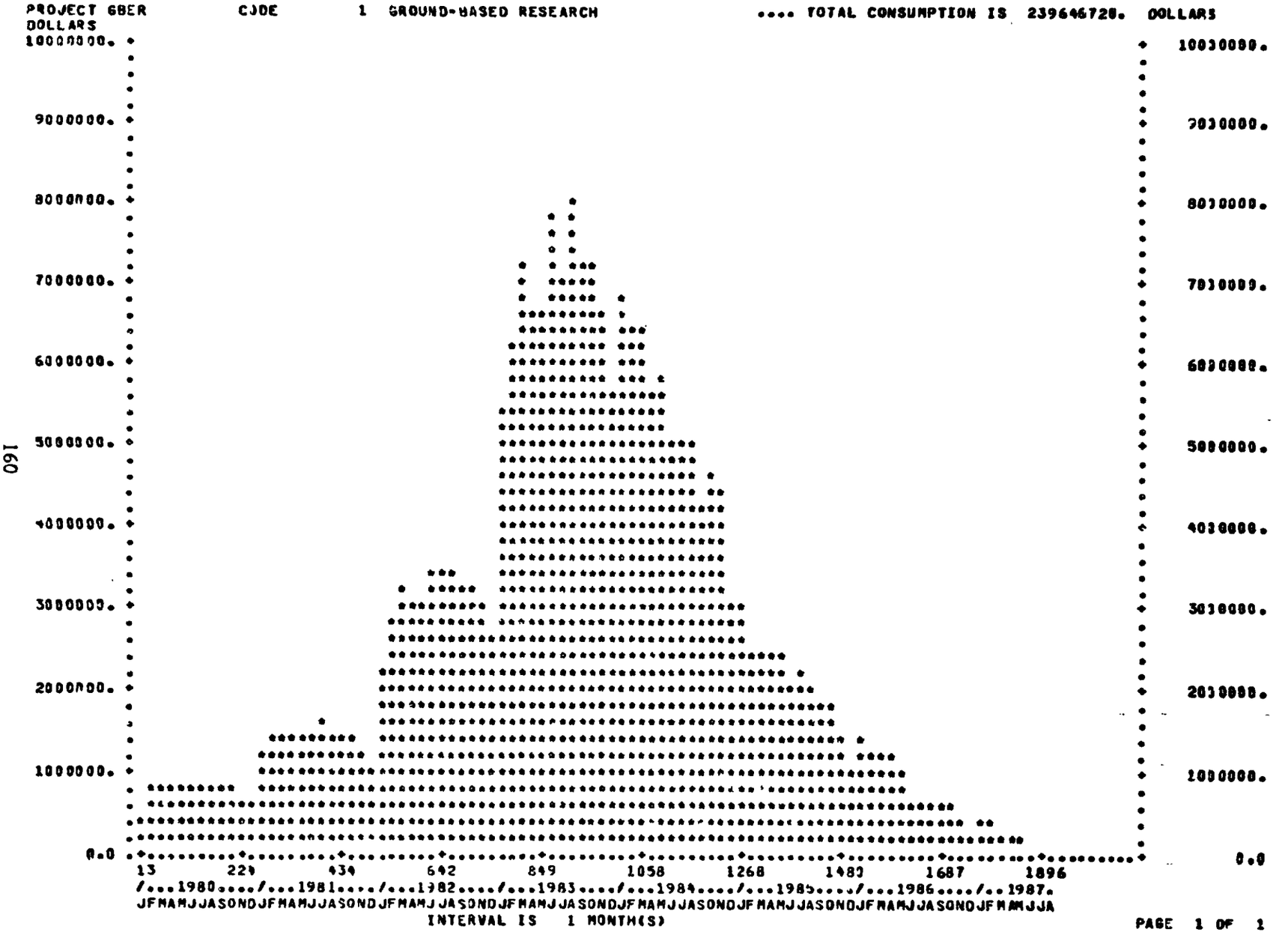
ACTIVITY NODE=O/FE	RESOURCE	DESCRIPTION	DAILY USAGE	TOTAL USAGE		DUR	START	FINISH
	1.60	PHYSICS TECHNOLOGY	2.0	1500.0	MAN	DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	750.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	2.0	1500.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	750.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	750.0	MAN	DAYS		
	4.00	MANUFACTURING	3.0	2250.0	MAN	DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	750.0	MAN	DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	750.0	MAN	DAYS		
	4.50	SPECIALTY SHOP	1.0	750.0	MAN	DAYS		
	5.00	CONSTRUCTION & FIELD OPS	3.0	2250.0	MAN	DAYS		
	5.30	SITE ACIVATION & OPS	3.0	2250.0	MAN	DAYS		
30303029		CONDUCT WEATHER SCATTERING EFFECTS TESTS				400	15JAN80	12AUG81
	1.00	TECHNOLOGY ENGINEERING	7.5	3000.0	MAN	DAYS		
	1.10	MECHANICAL/STRUCT ENGINEERING	0.5	200.0	MAN	DAYS		
	1.30	ELECTRIC POWER ENGINEERING	1.0	400.0	MAN	DAYS		
	1.40	ELECTRONIC ENGINEERING	3.0	1200.0	MAN	DAYS		
	1.60	PHYSICS TECHNOLOGY	2.0	800.0	MAN	DAYS		
	1.70	MATH & SOFTWARE ENGINEERING	1.0	400.0	MAN	DAYS		
	3.00	TECHNICAL SUPPORT	2.0	800.0	MAN	DAYS		
	3.10	ENGR AIDES, DRAFTING	1.0	400.0	MAN	DAYS		
	3.20	CLERICAL, GRAPHICS	1.0	400.0	MAN	DAYS		
	4.00	MANUFACTURING	3.0	1200.0	MAN	DAYS		
	4.10	MECH/STRUCT DEV SHOP	1.0	400.0	MAN	DAYS		
	4.20	ELEC/ELECTRONIC DEV SHOP	1.0	400.0	MAN	DAYS		
	4.50	SPECIALTY SHOP	1.0	400.0	MAN	DAYS		
	5.00	CONSTRUCTION & FIELD OPS	3.0	1200.0	MAN	DAYS		
	5.30	SITE ACIVATION & OPS	3.0	1200.0	MAN	DAYS		


PROJECT 63ER
TOTAL CONSUMPTION IS 438443600. DOLLARS
DOLLARS
25000000.
22500000.
20000000.
17500000.
15000000.
12500000.
10000000.
7500000.
5000000.
2500000.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
1980
1981
1982
1983
1984
1985
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA
INTERVAL IS 1 MONTH(S)



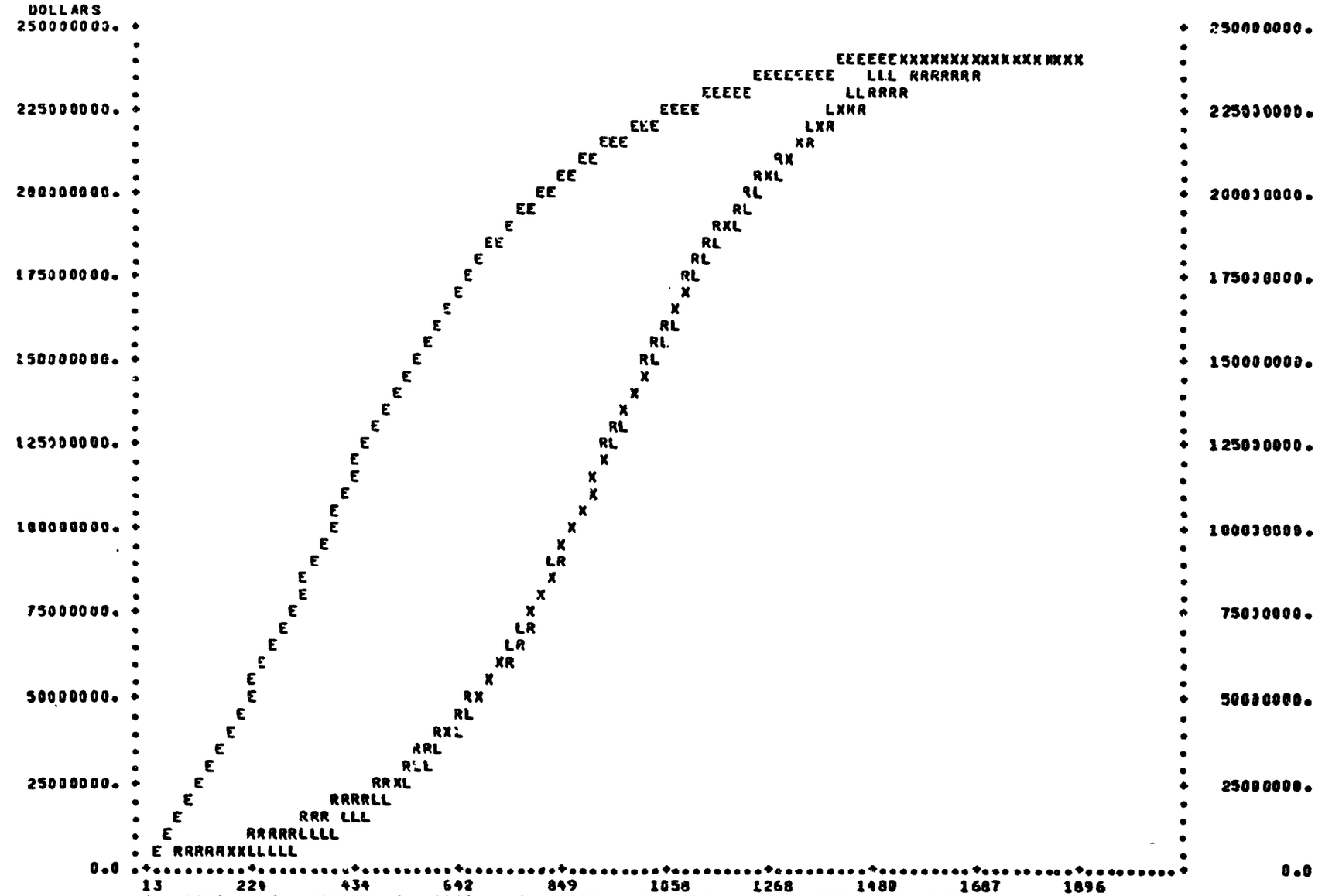
159

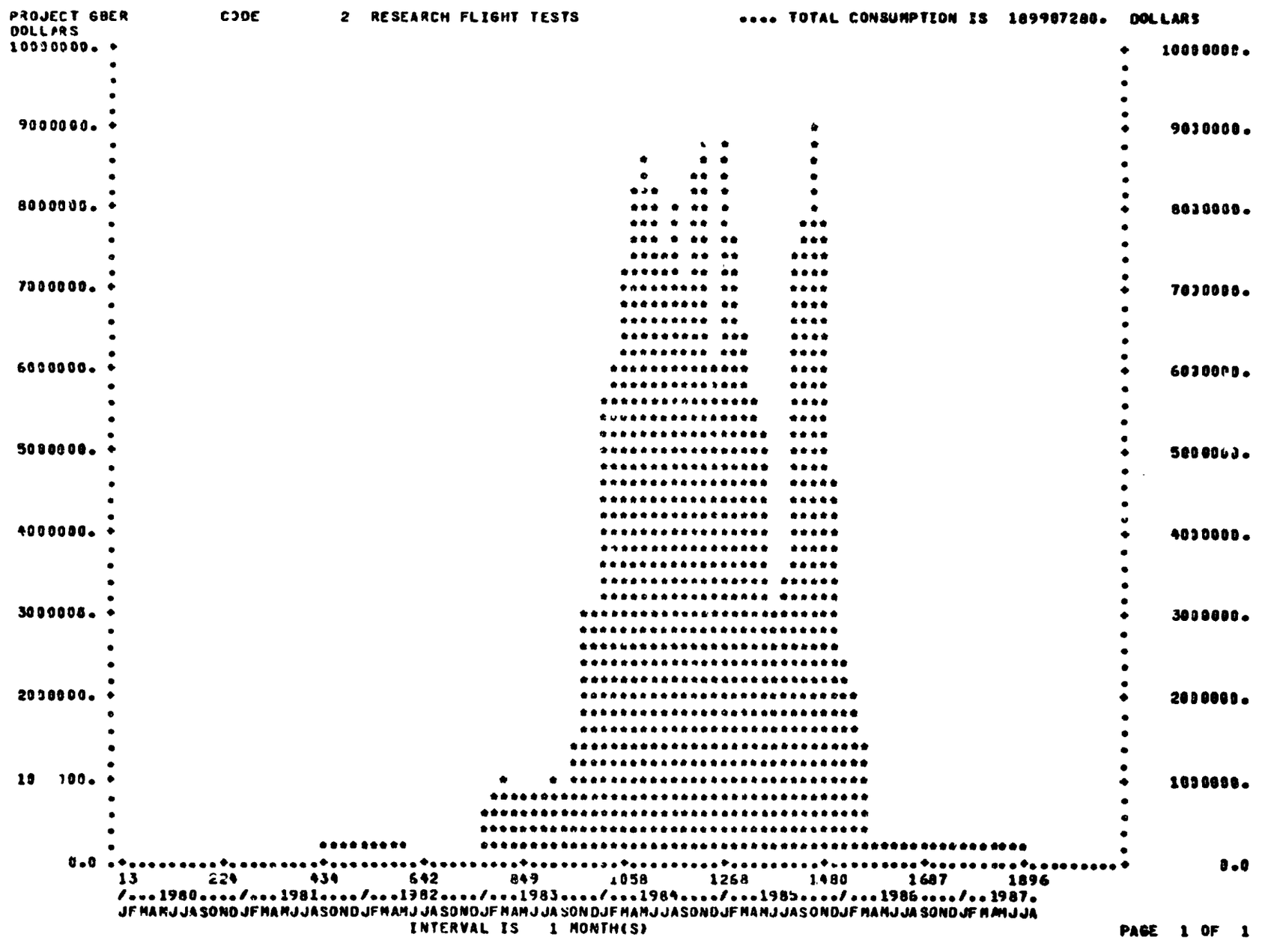
D180-25381-1


PROJECT GBER CODE 1 GROUND-BASED RESEARCH .... TOTAL CONSUMPTION IS 239646728. DOLLARS
DOLLARS
10000000.
9000000.
8000000.
7000000.
6000000.
5000000.
4000000.
3000000.
2000000.
1000000.
0.0
13 229 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987.
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA
INTERVAL IS 1 MONTH(S)

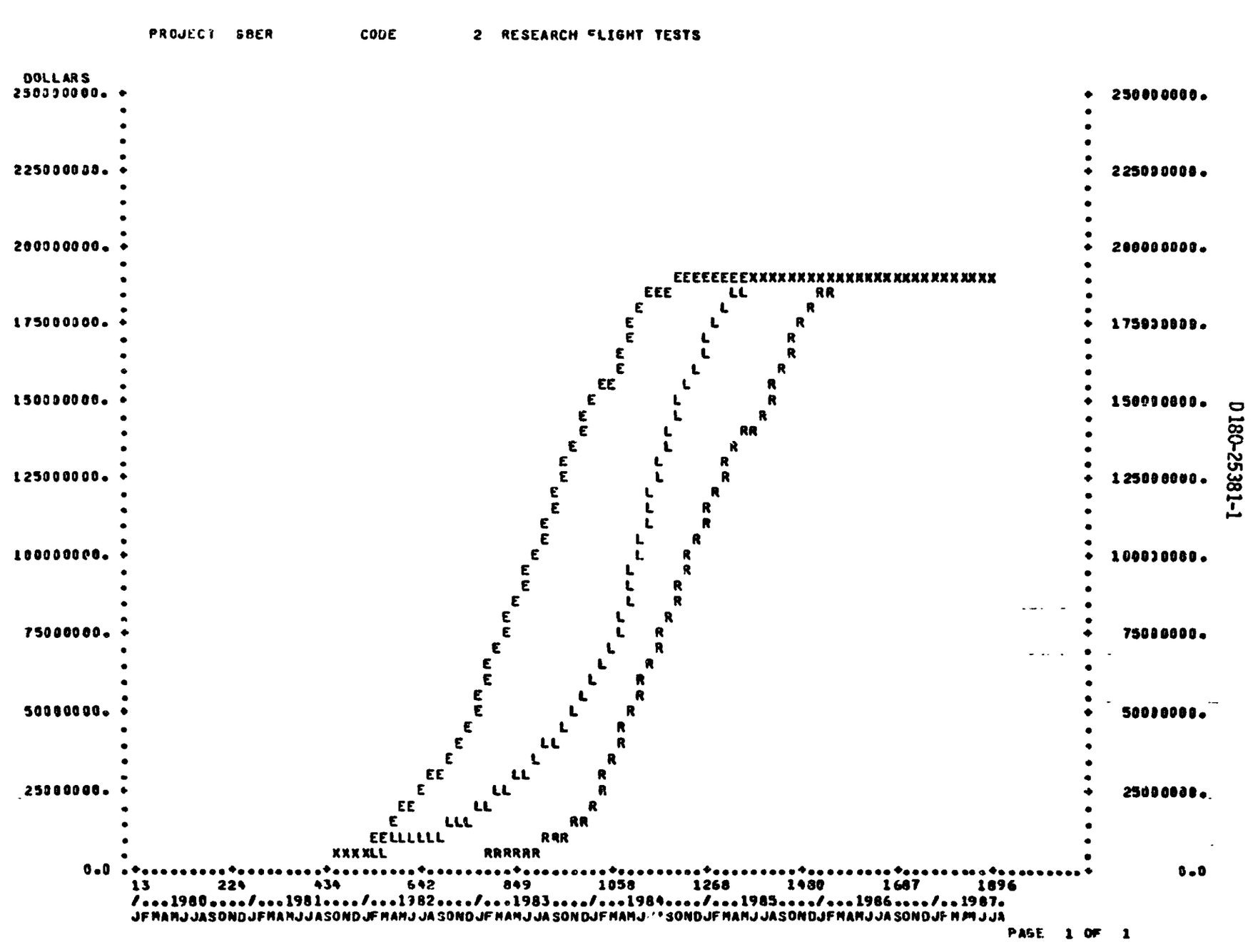
D180-25381-1

PROJECT SBER CODE 1 GROUND-BASED RESEARCH




PROJECT GBER CODE 2 RESEARCH FLIGHT TESTS .... TOTAL CONSUMPTION IS 189987280. DOLLARS
DOLLARS
10000000.
9000000.
8000000.
7000000.
6000000.
5000000.
4000000.
3000000.
2000000.
1000000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../...1987.
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA
INTERVAL IS 1 MONTH(S)

PAGE 1 OF 1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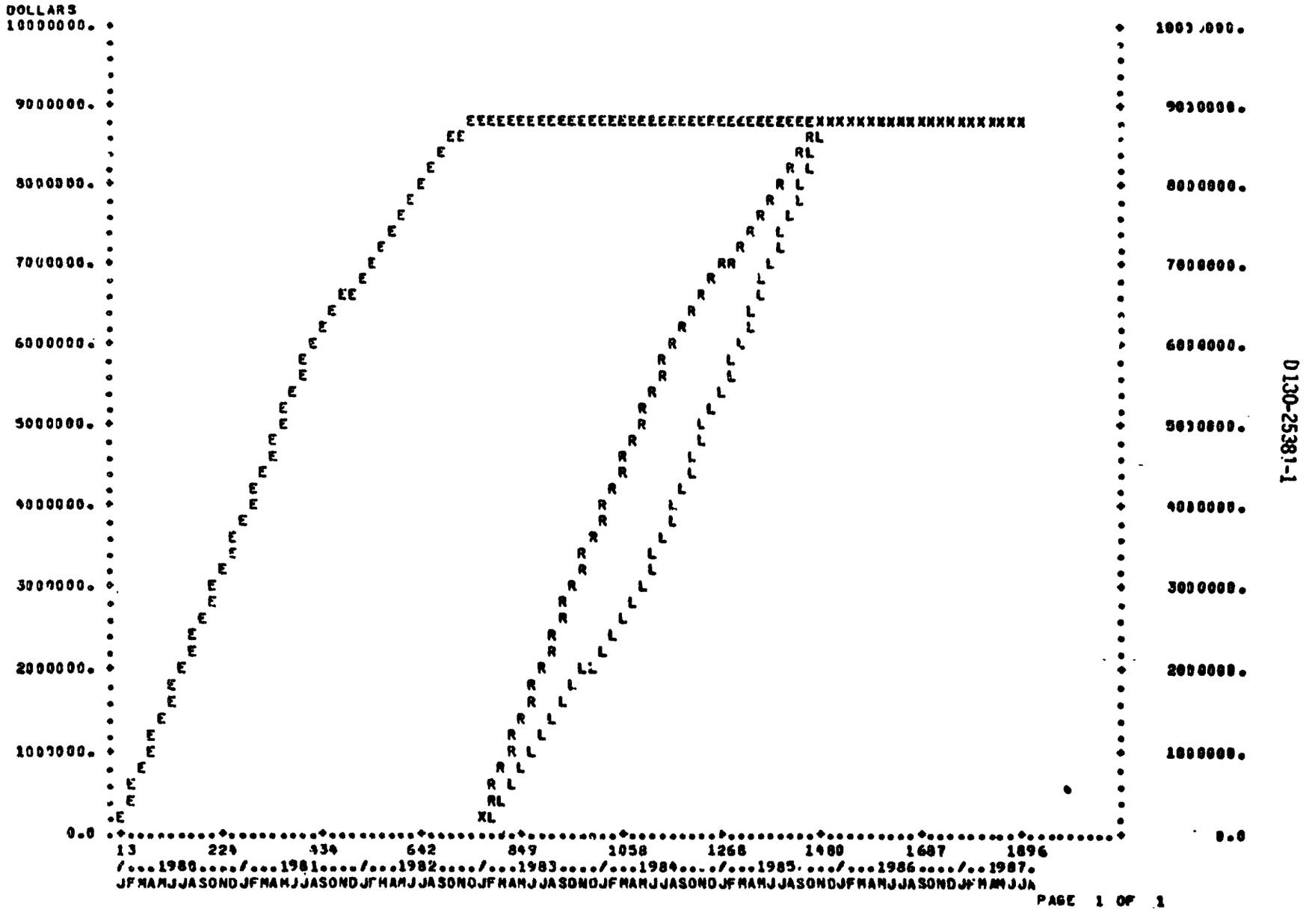
DOLLARS
250000000.
225000000.
200000000.
175000000.
150000000.
125000000.
100000000.
75000000.
50000000.
25000000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987.
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJ''SONDJFMAMJJASONDJFMAMJJASONDJFMMJJA
PAGE 1 OF 1


PROJECT GBER CODE 3 ENVIRONMENTAL IMPACT TESTS .... TOTAL CONSUMPTION IS 8889680. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
/....1980....../....1981....../....1982....../....1983....../....1984....../....1985....../....1986....../....1987.
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1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7000000.
6000000.
5000000.
4000000.
3000000.
2000000.
1000000.
0.0
13
224
434
642
849
1058
1268
1480
1687
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1980
1981
1982
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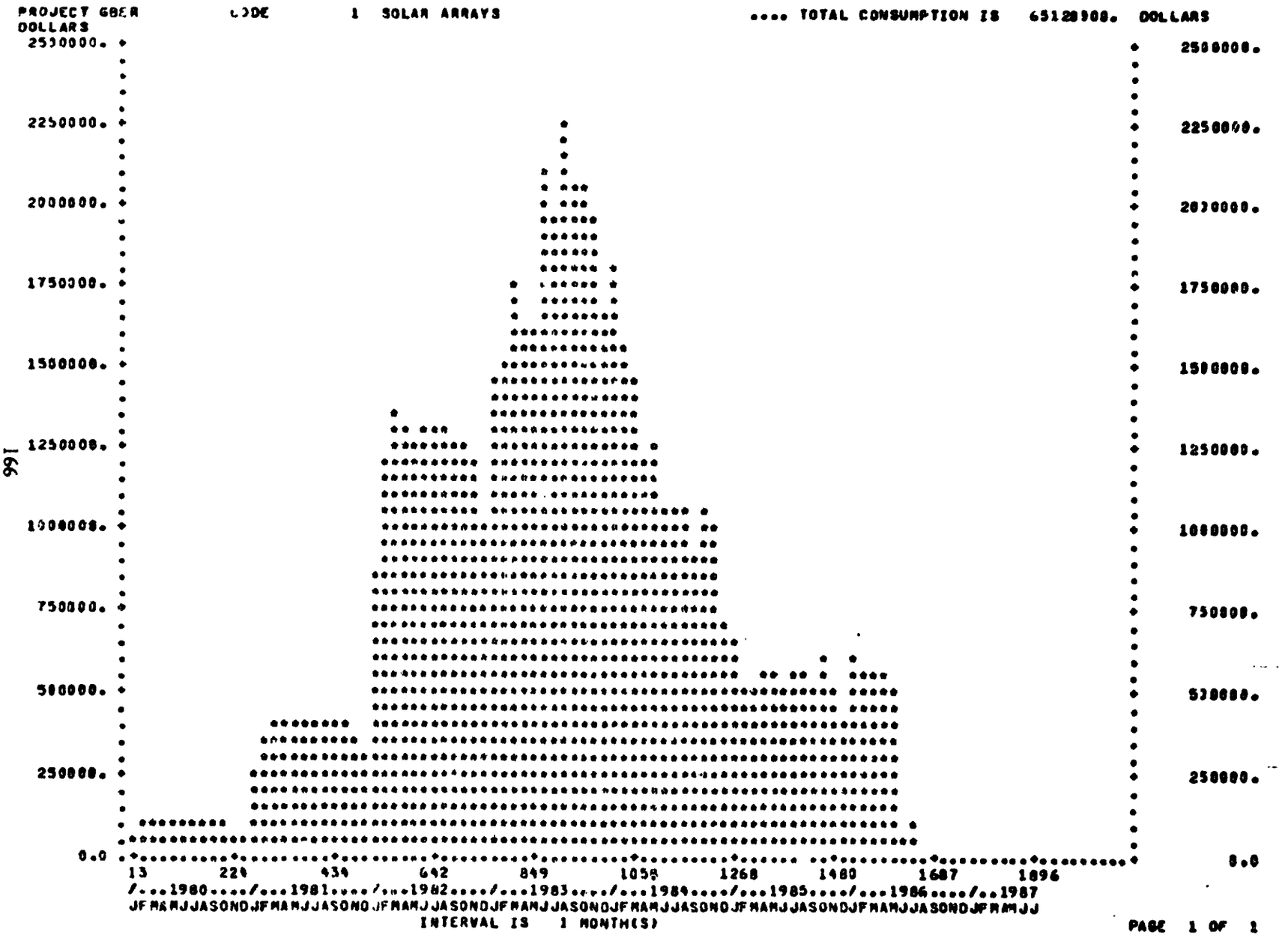
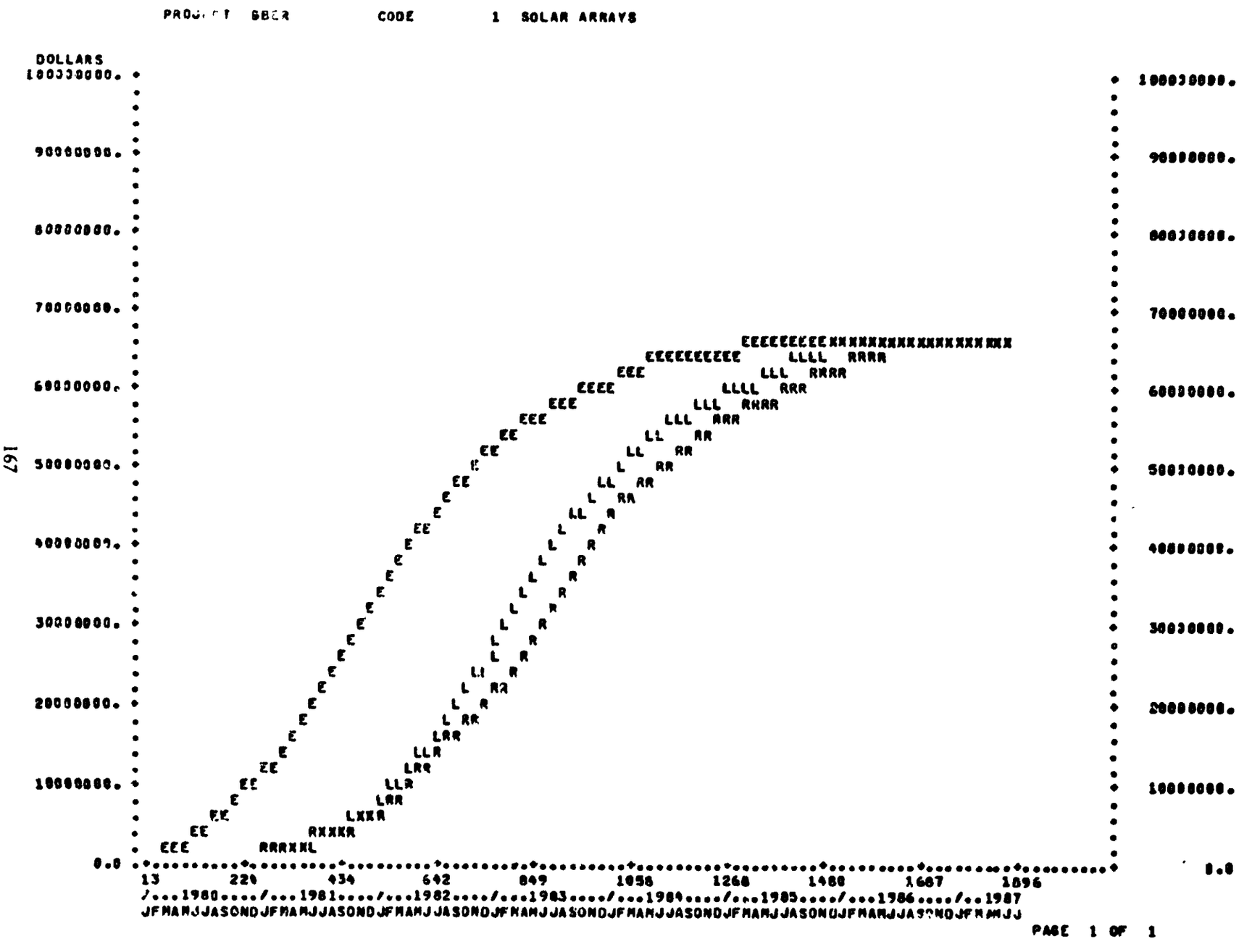
1985
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJA
PAGE 1 OF 1

0130-2581-1


PROJECT GBER CODE 1 SOLAR ARRAYS .... TOTAL CONSUMPTION IS 65128908. DOLLARS
DOLLARS
2500000.
2250000.
2000000.
1750000.
1500000.
1250000.
1000000.
750000.
500000.
250000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
1980 1981 1982 1983 1984 1985 1986 1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)

0180-2538I-1


PROJECT BBER CODE 1 SOLAR ARRAYS
DOLLARS
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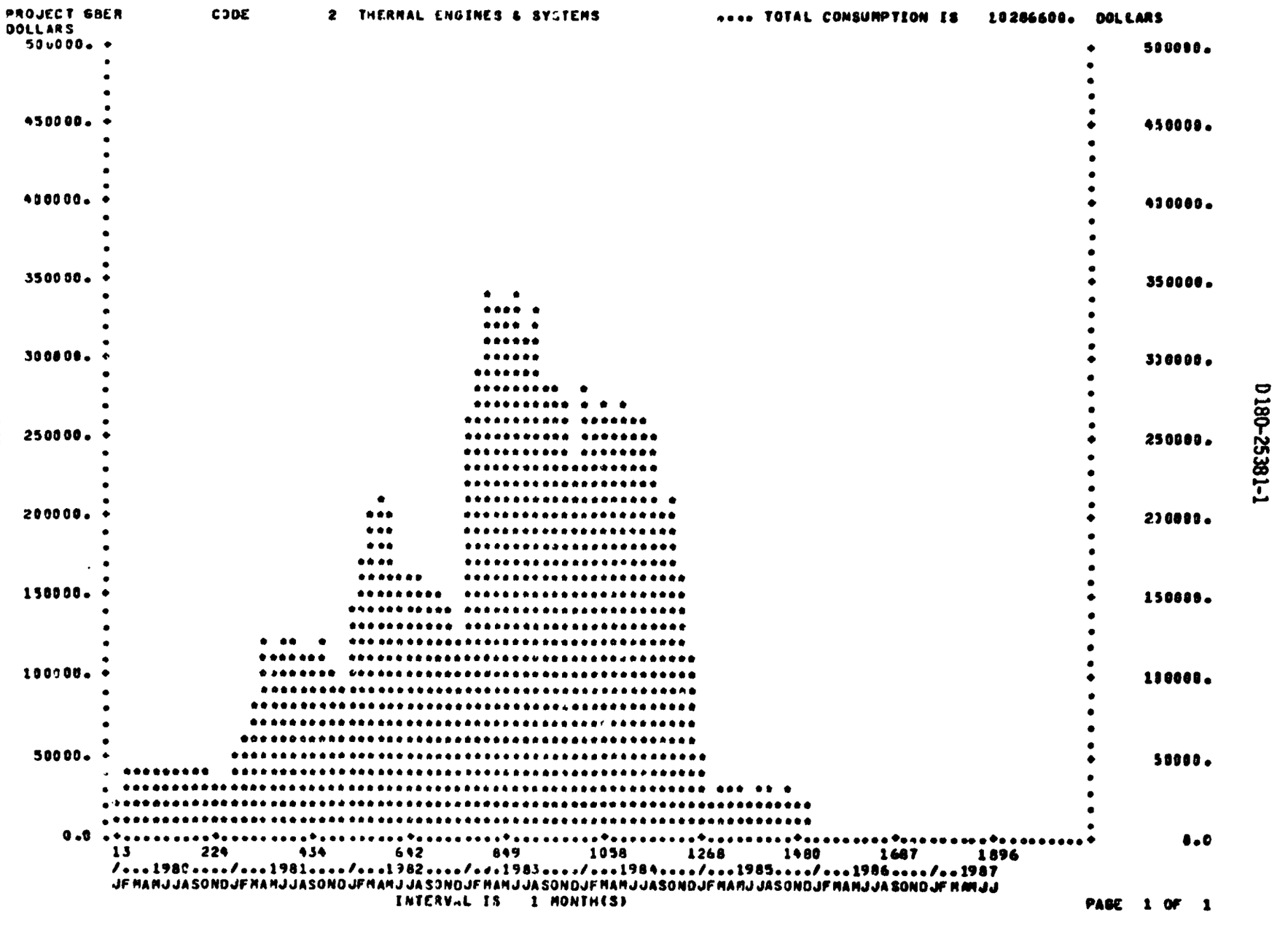
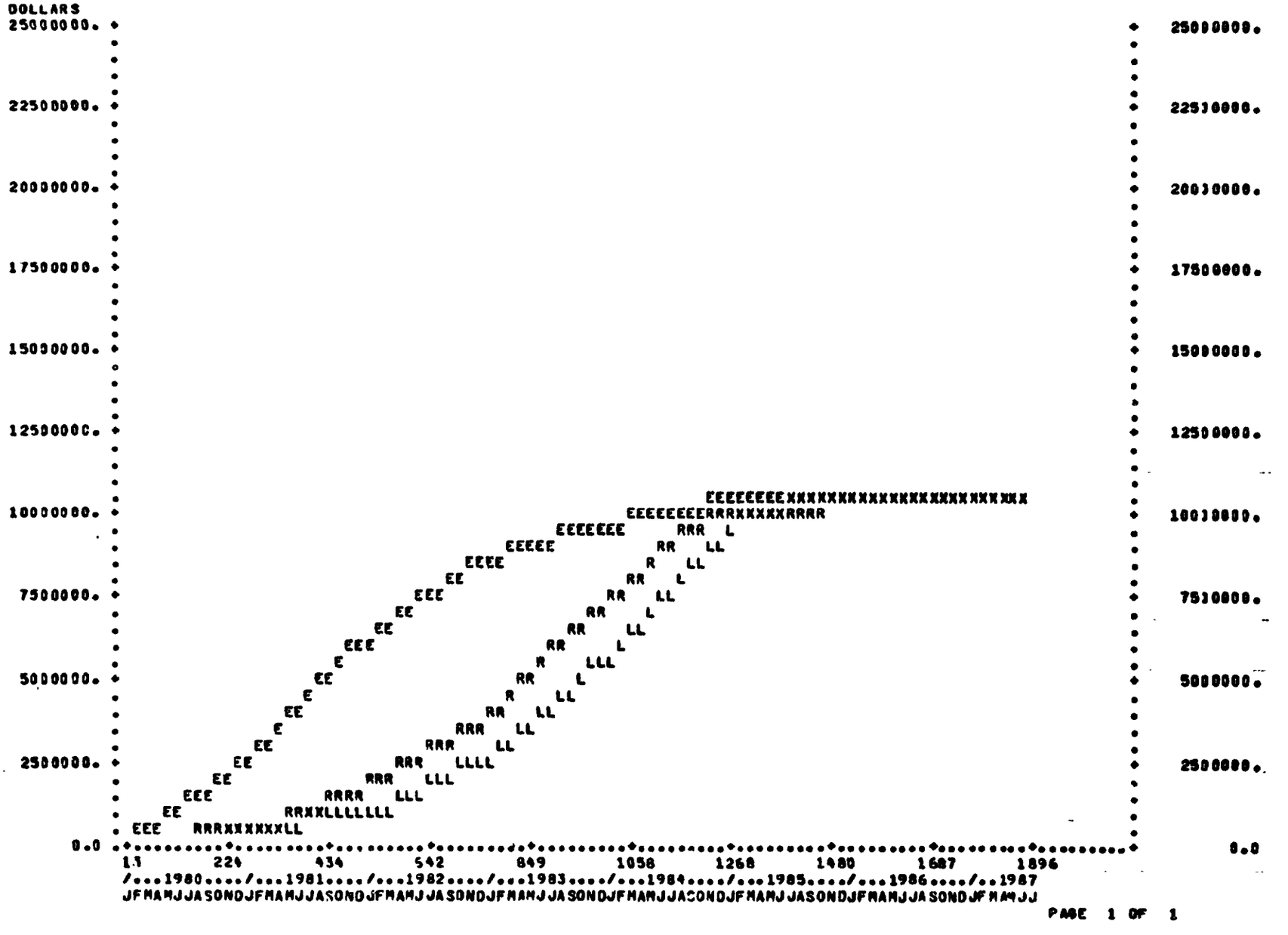
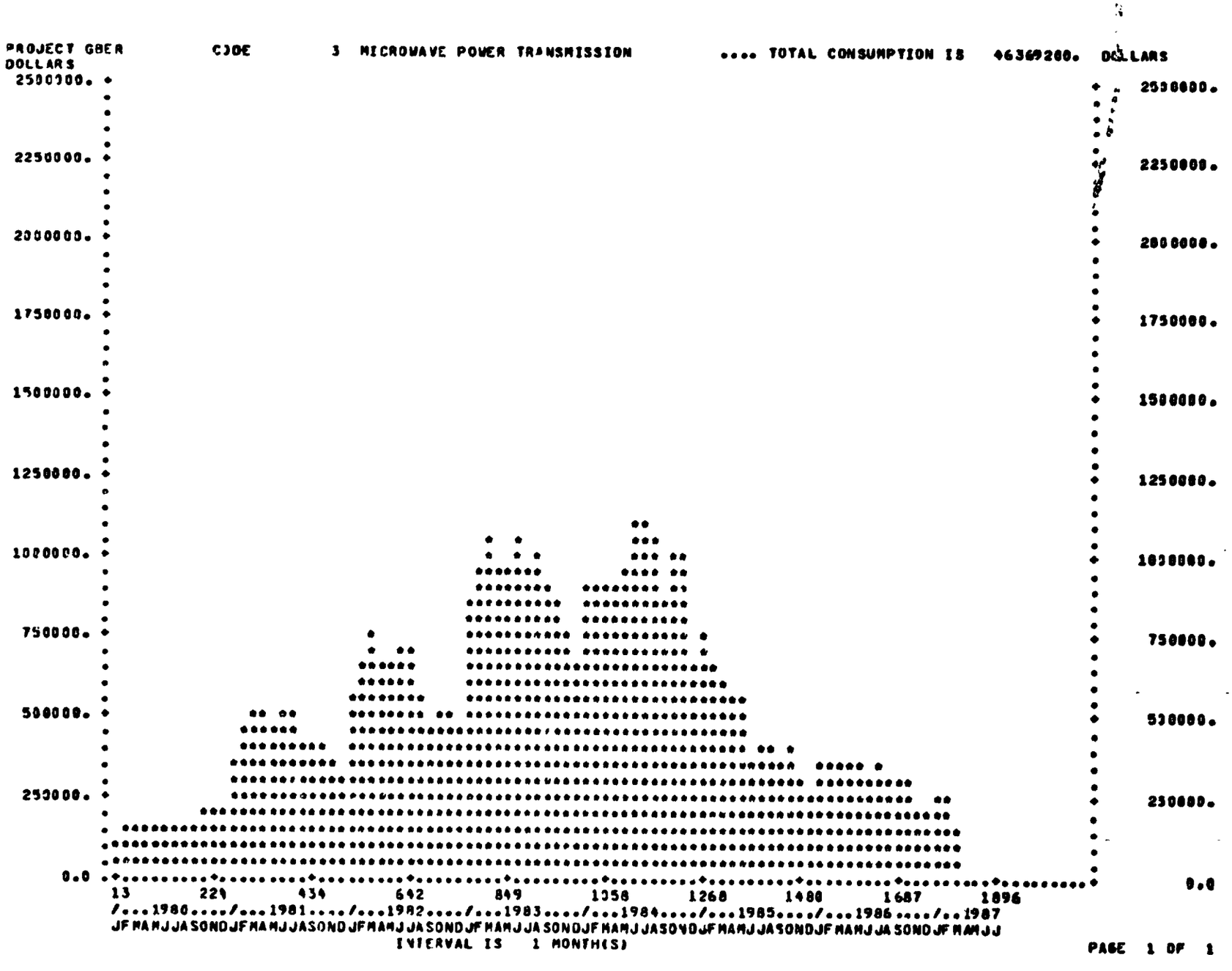
90000000.
80000000.
70000000.
60000000.
50000000.
40000000.
30000000.
20000000.
10000000.
0.0
13 220 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
PAGE 1 OF 1

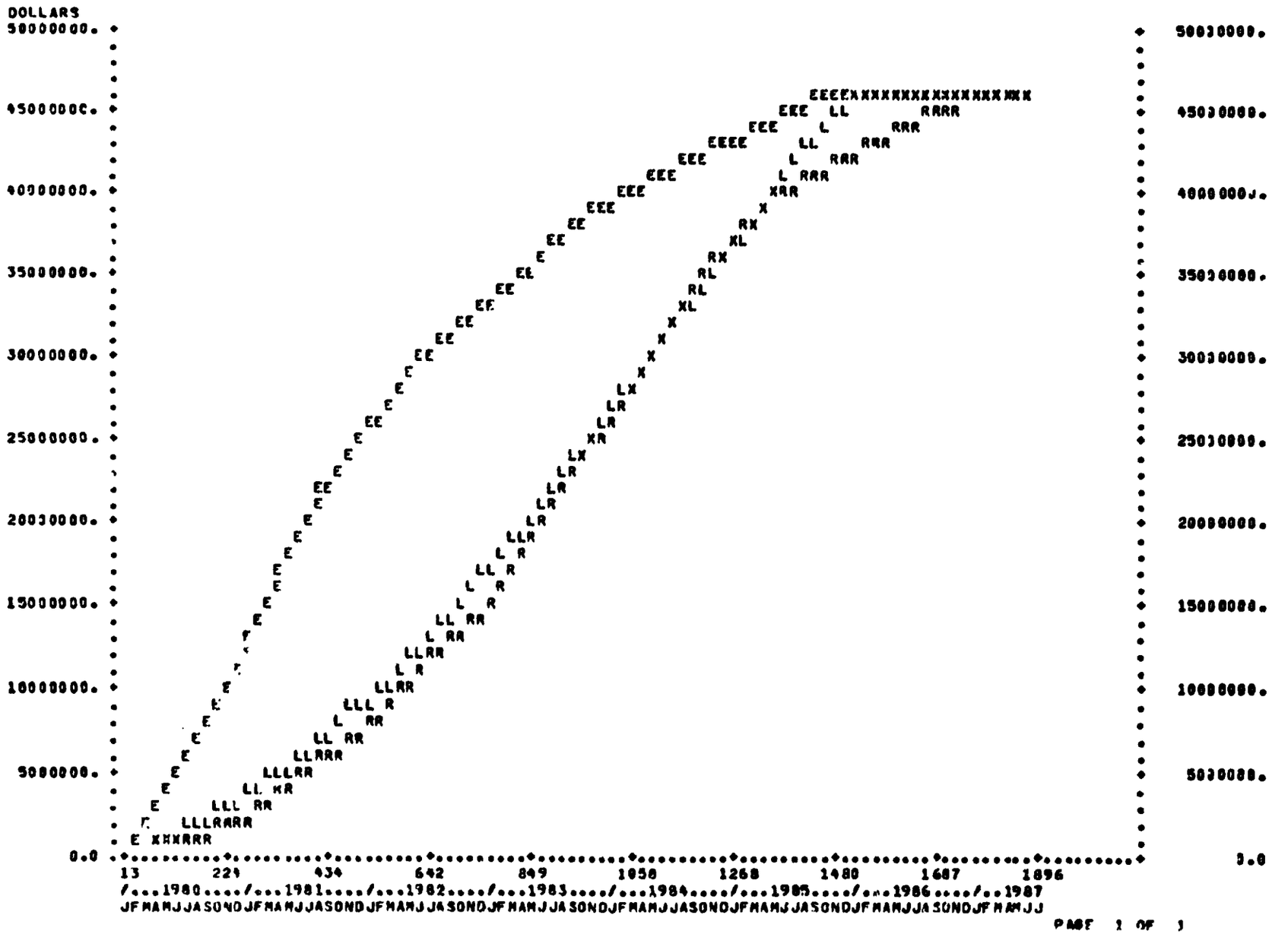

PROJECT GBER CODE 2 THERMAL ENGINES & SYSTEMS .... TOTAL CONSUMPTION IS 10286600. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980....../...1981....../...1982....../...1983....../...1984....../...1985....../...1986....../...1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)

PROJECT 38ER CODE 2 THERMAL ENGINES & SYSTEMS




PROJECT GBER CODE 3 MICROWAVE POWER TRANSMISSION .... TOTAL CONSUMPTION IS 46369200. DOLLARS
DOLLARS
2500000.
2250000.
2000000.
1750000.
1500000.
1250000.
1000000.
750000.
500000.
250000.
0.0
13 229 434 642 849 1058 1268 1488 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1

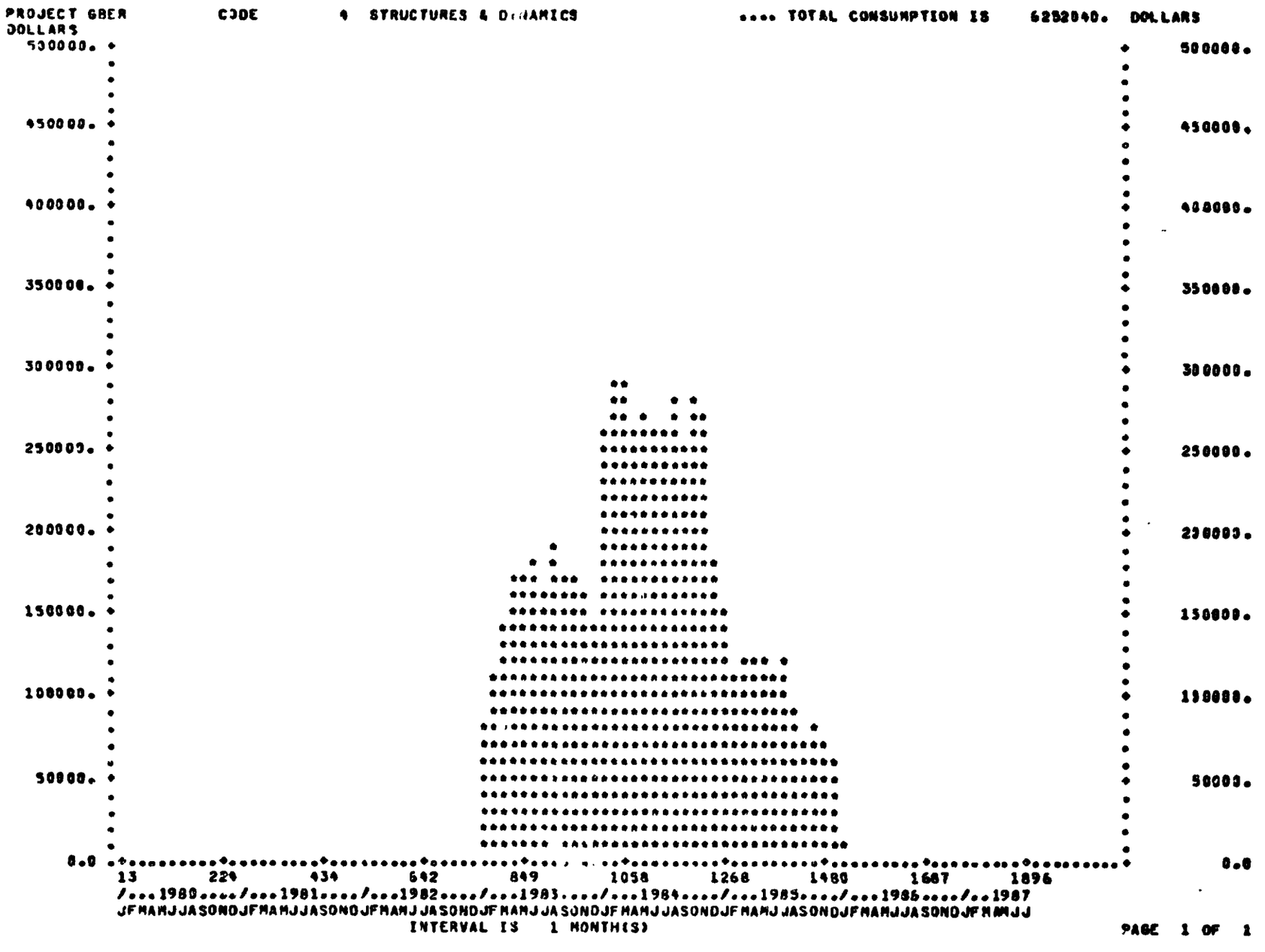
PROJECT GBER CODE 3 MICROWAVE POWER TRANSMISSION



PAGE 1 OF 1

171

G180-2538-1


PROJECT GBER CODE 4 STRUCTURES & DYNAMICS .... TOTAL CONSUMPTION IS 6252040. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
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224
434
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849
1058
1268
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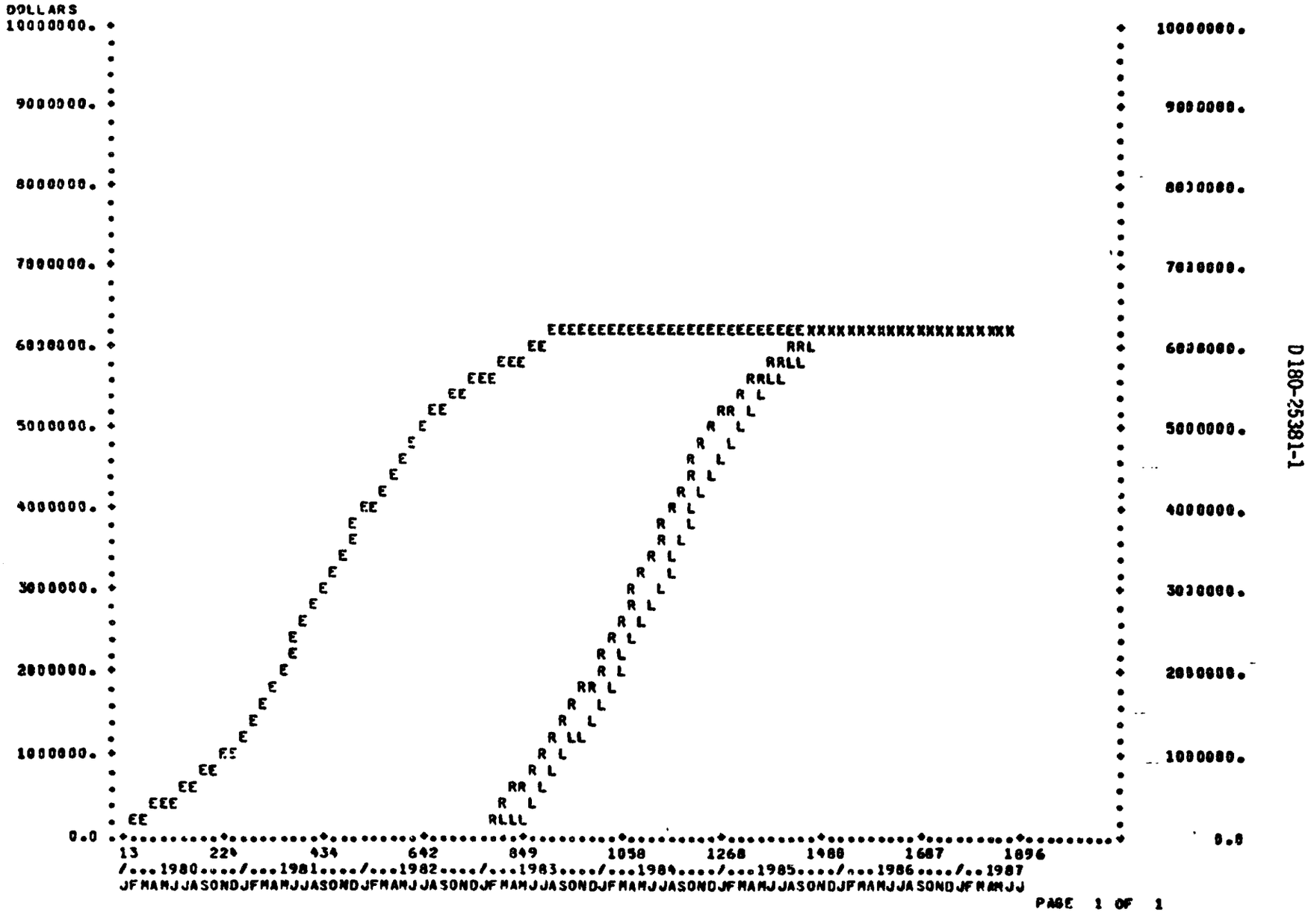
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1


PROJECT 6BER CODE 4 SYRUCTURES & DYNAMICS
DOLLARS
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9000000.
8000000.
7000000.
6000000.
5000000.
4000000.
3000000.
2000000.
1000000.
0.0
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642
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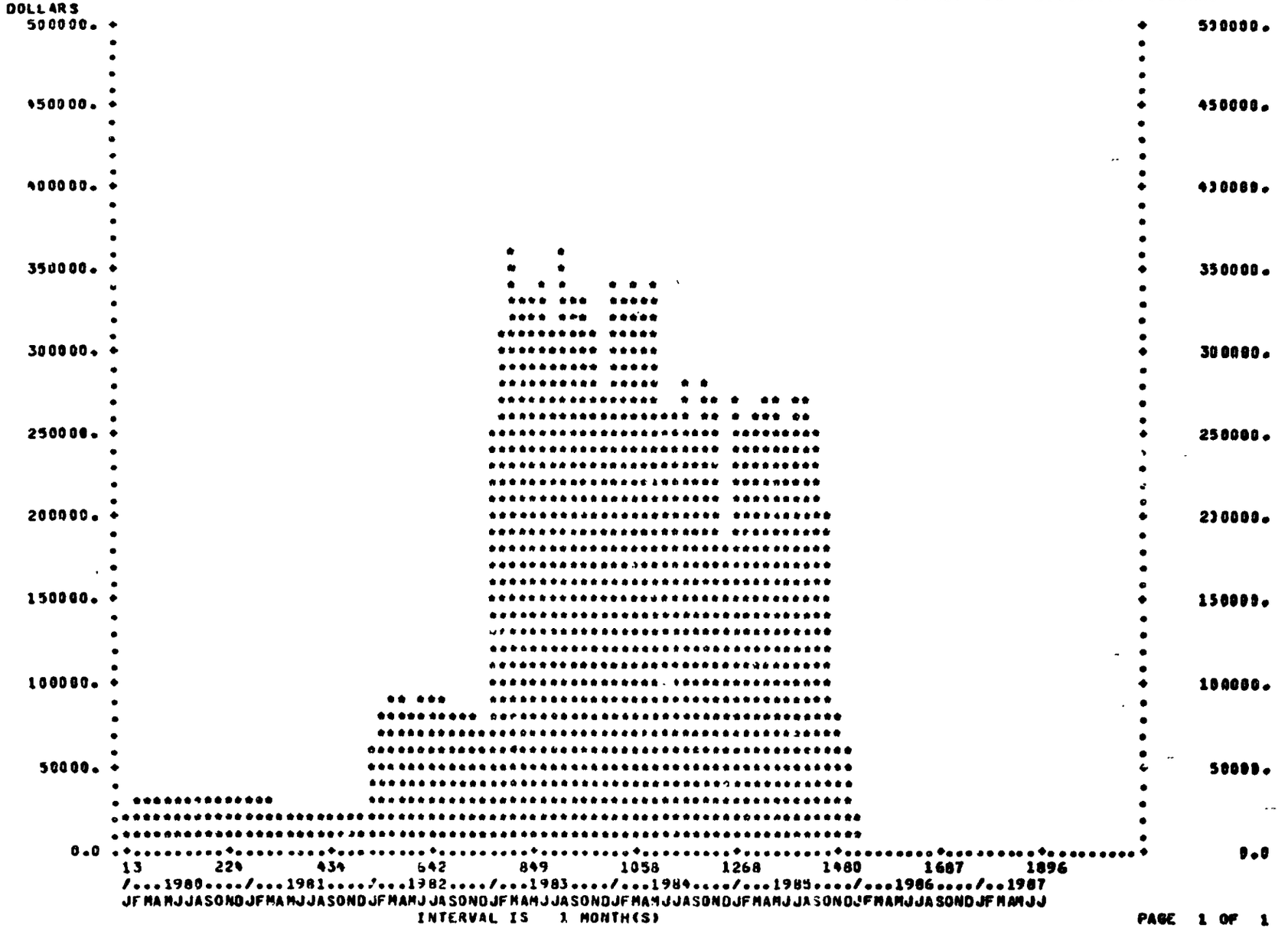
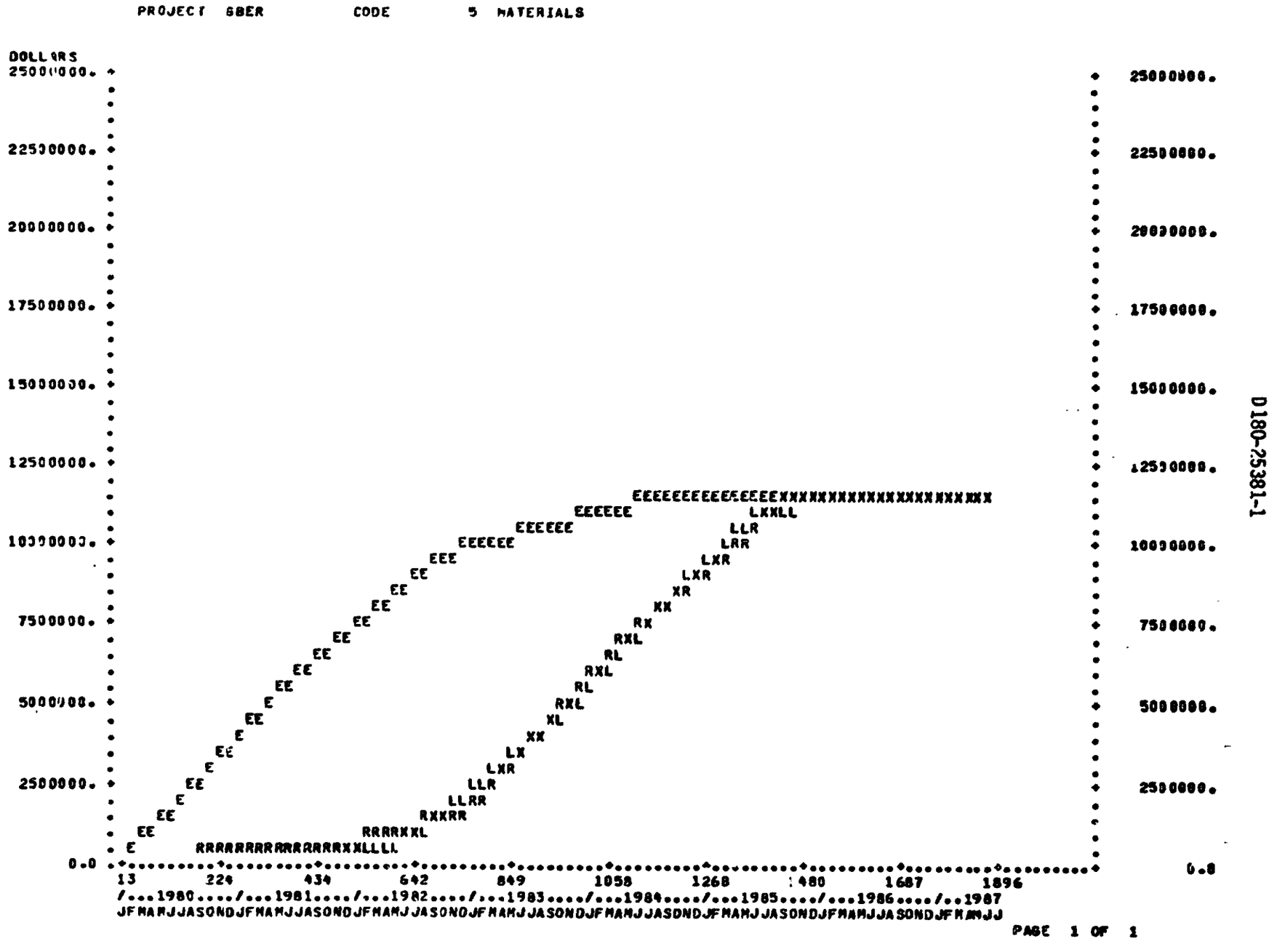
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
PAGE 1 OF 1


PROJECT GHEA CODE 5 MATERIALS .... TOTAL CONSUMPTION IS 11629000. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../...1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1


PROJECT GBER CODE 5 MATERIALS
DOLLARS
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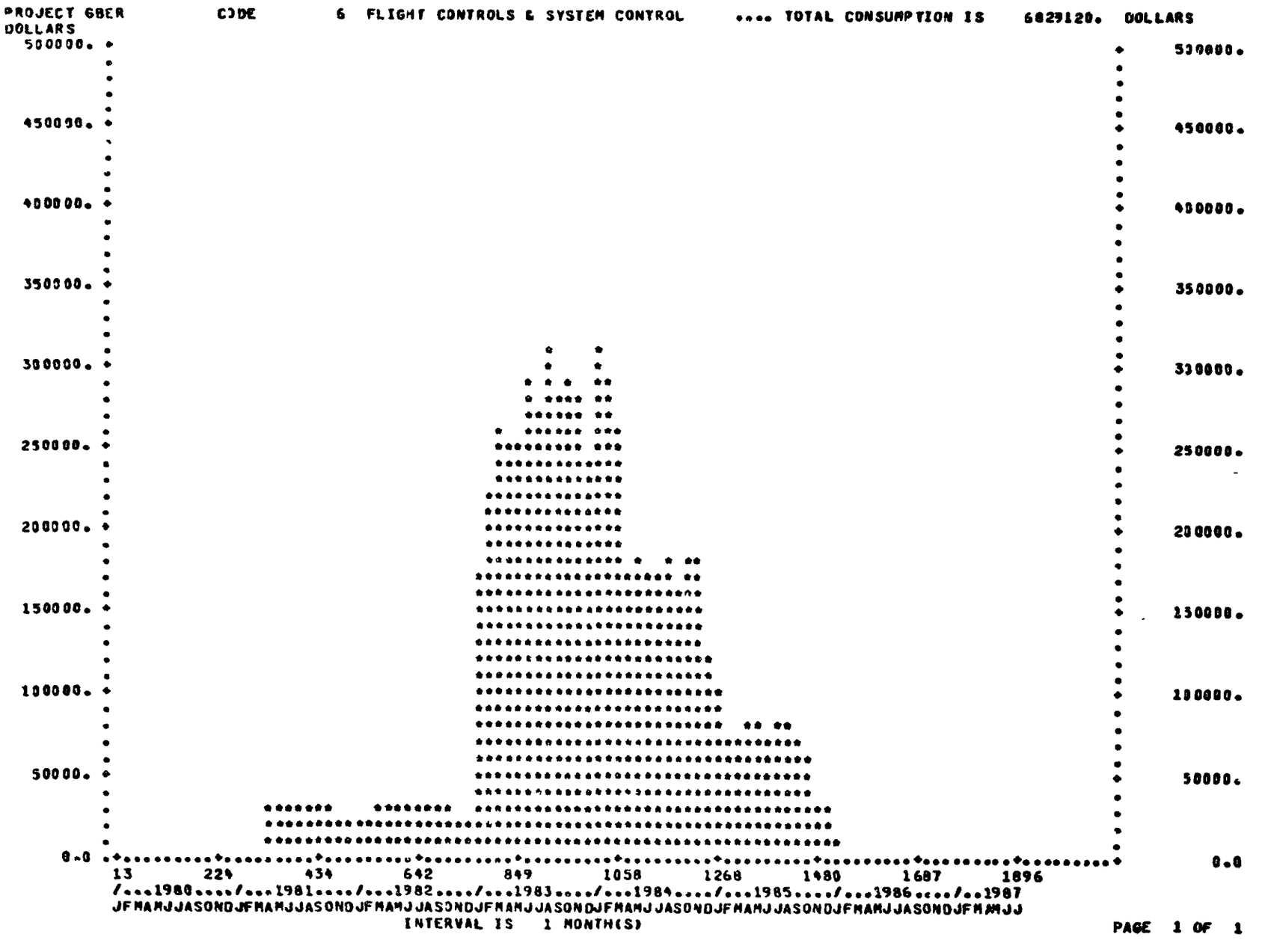
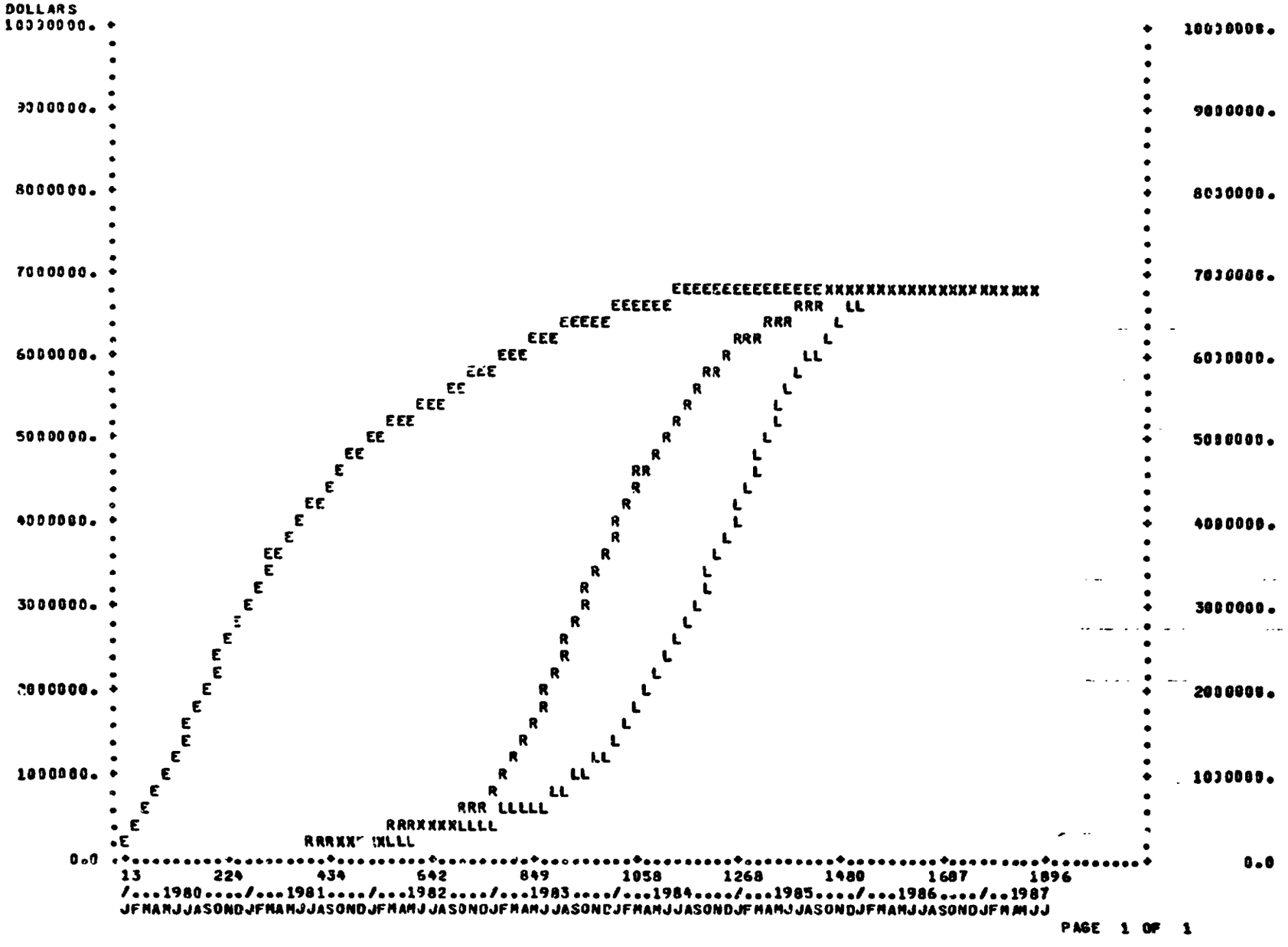
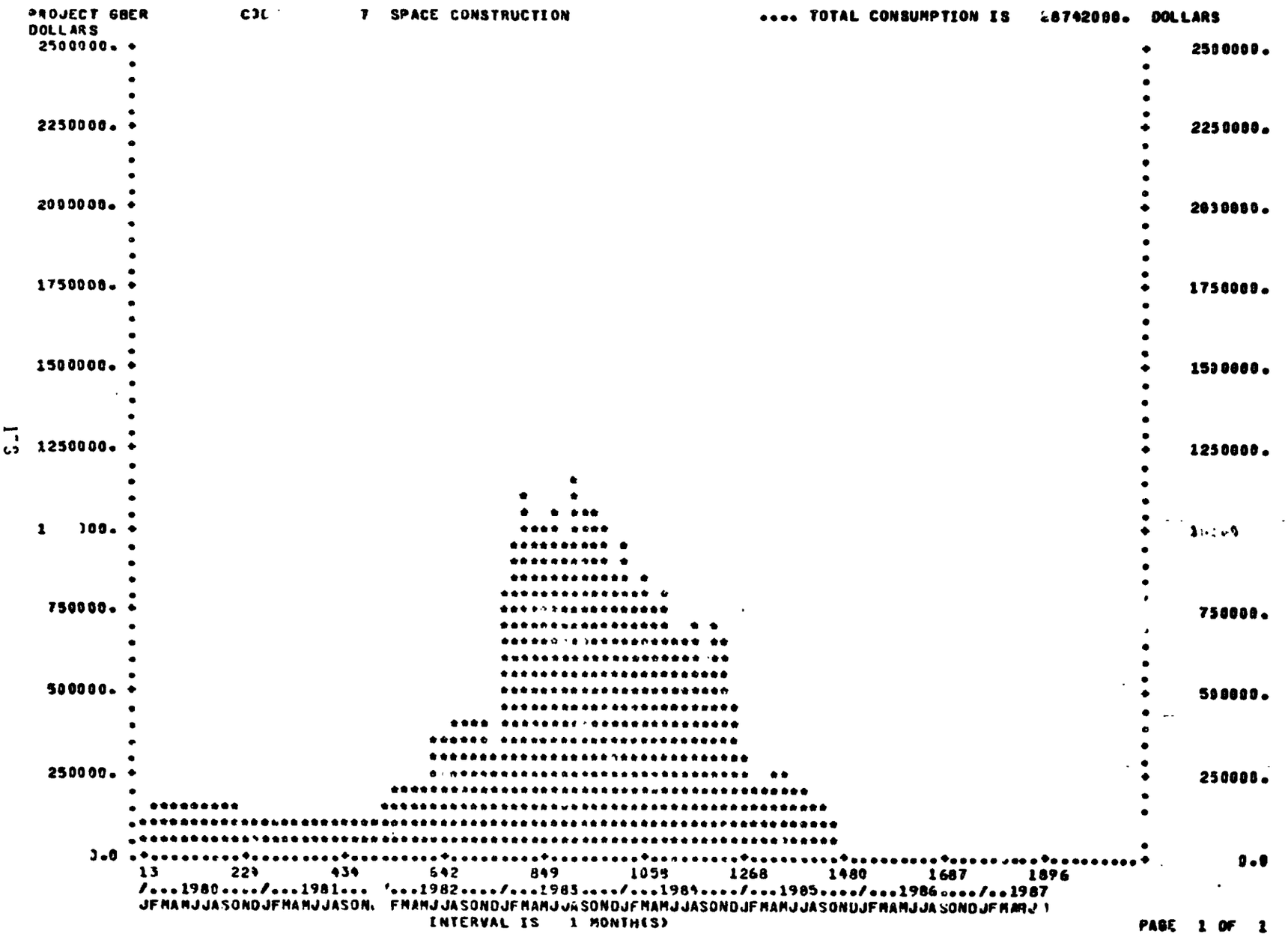
22500000.
20000000.
17500000.
15000000.
12500000.
10000000.
7500000.
5000000.
2500000.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
PAGE 1 OF 1


PROJECT GBER CODE 6 FLIGHT CONTROLS & SYSTEM CONTROL .... TOTAL CONSUMPTION IS 6829120. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980....../...1981....../...1982....../...1983....../...1984....../...1985....../...1986....../...1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)

PROJECT 6BER CODE 6 FLIGHT CONTROLS & SYSTEM CONTROL

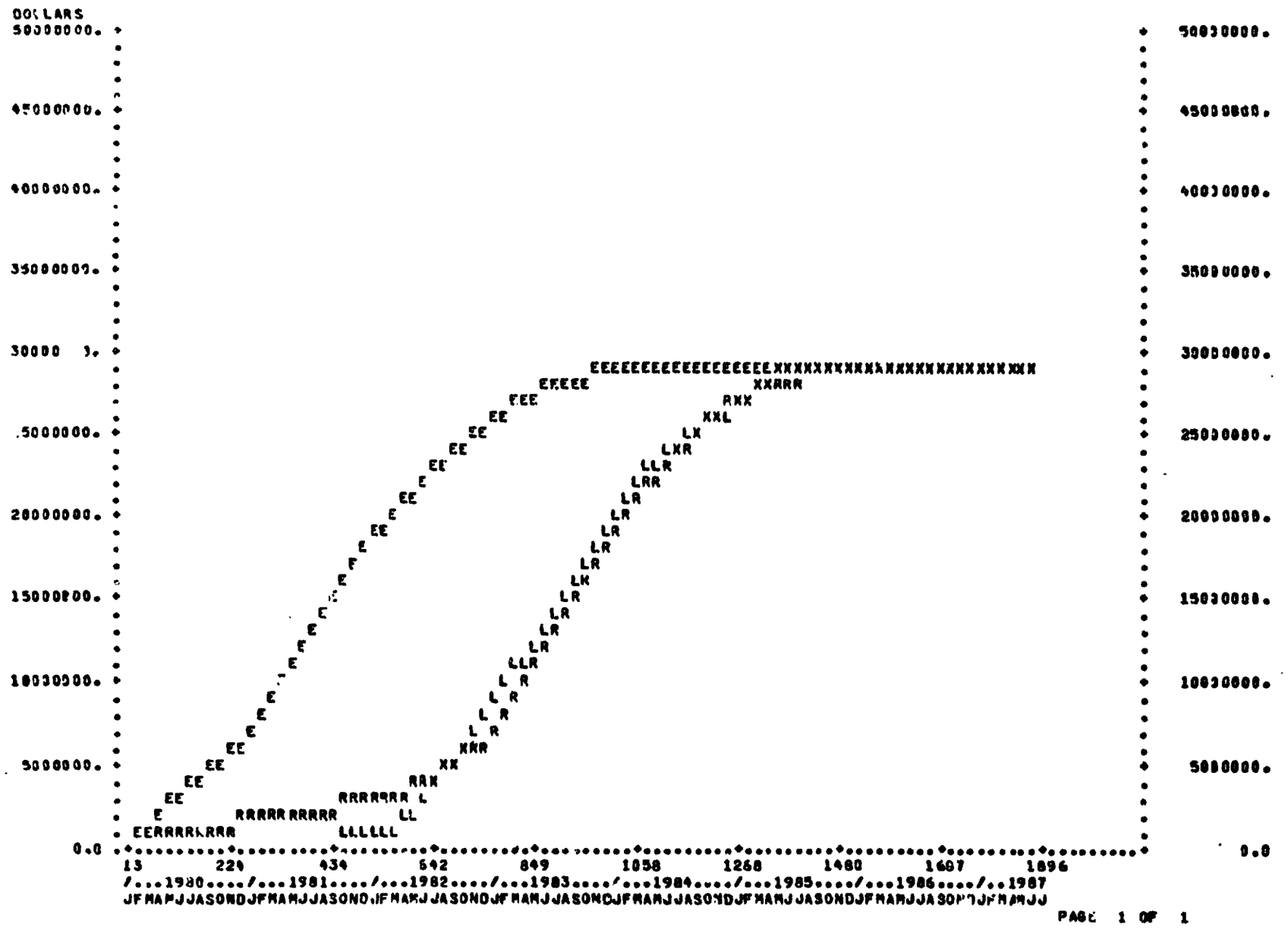


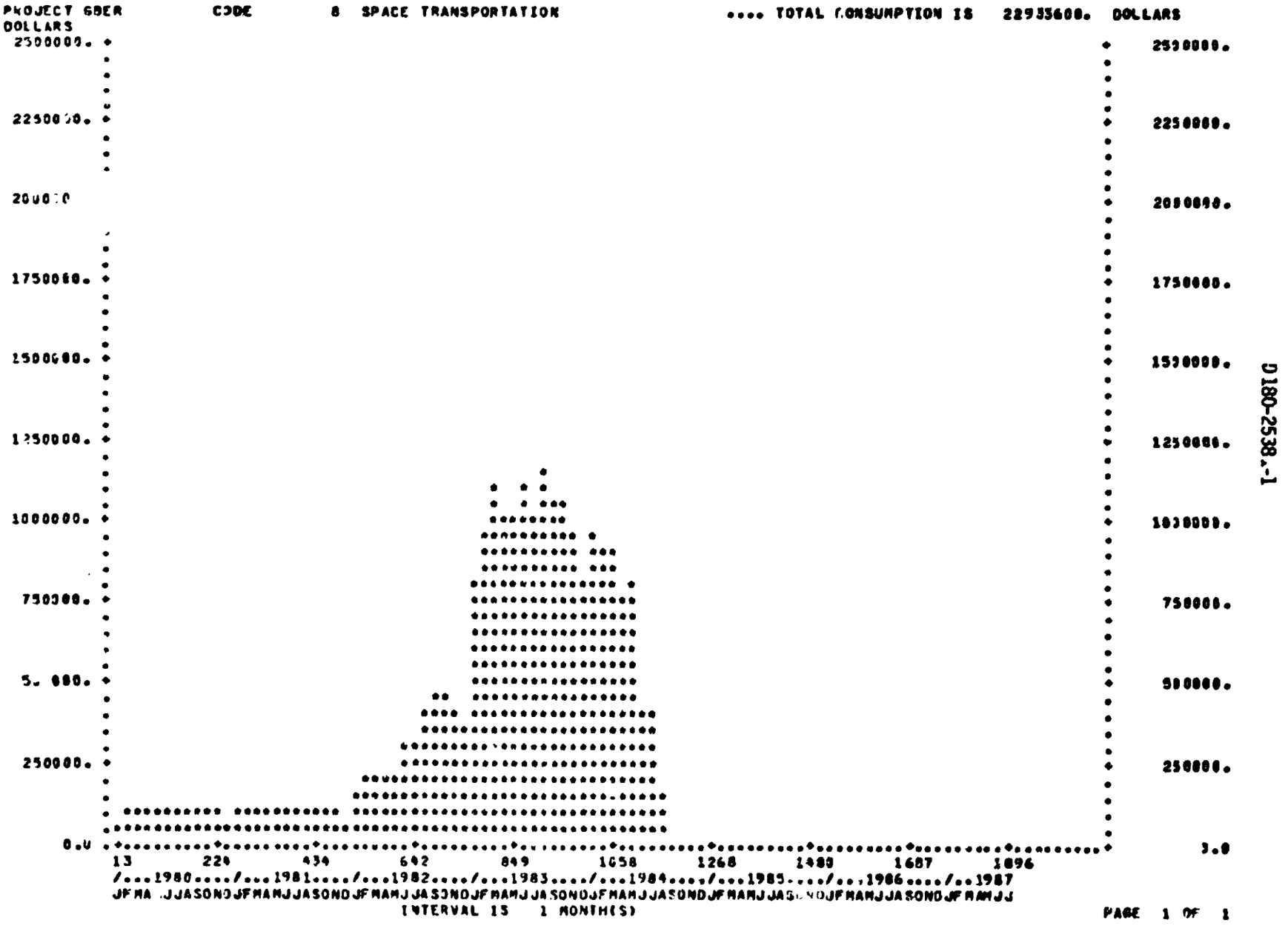


I-3

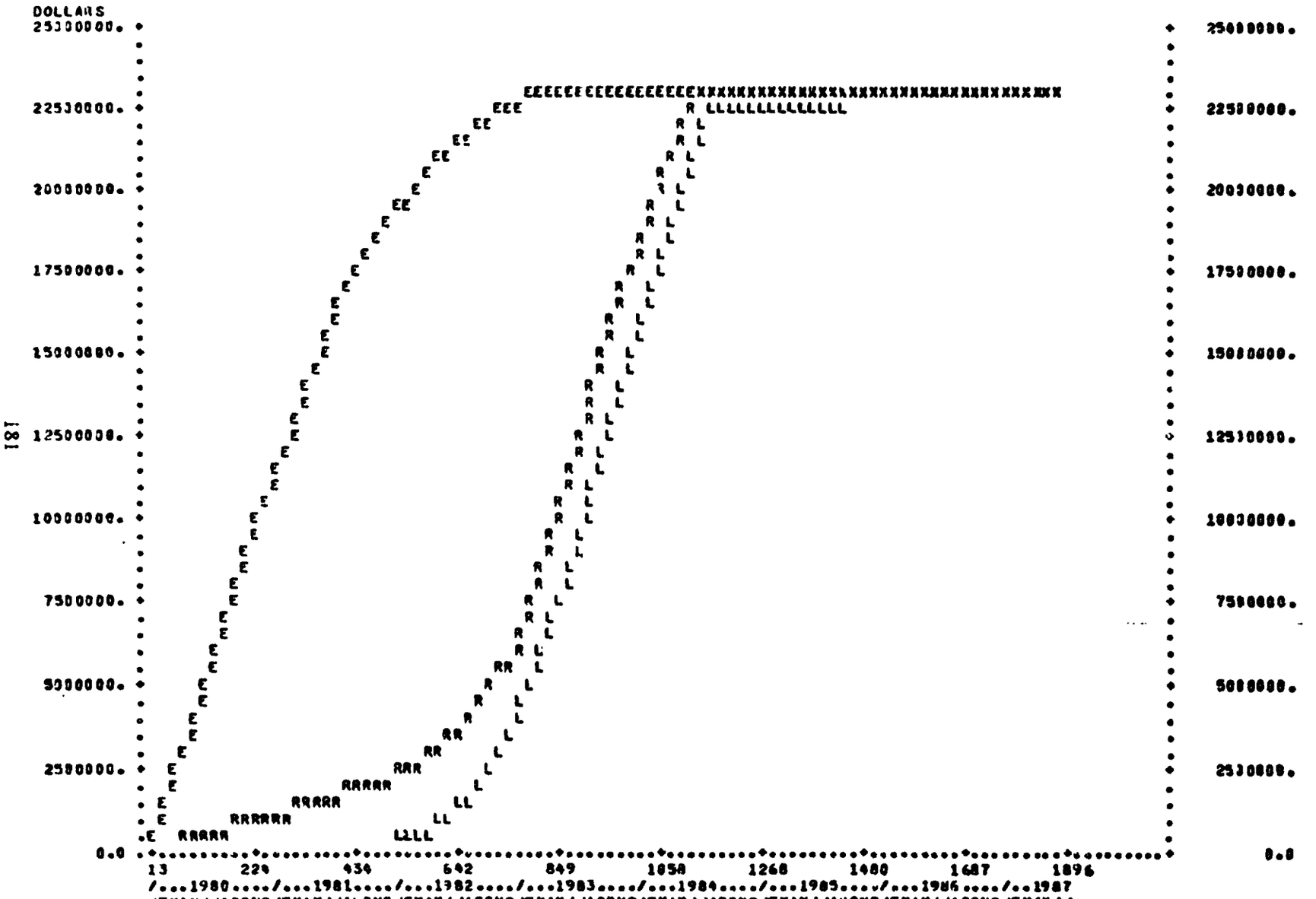
D180-25381-1

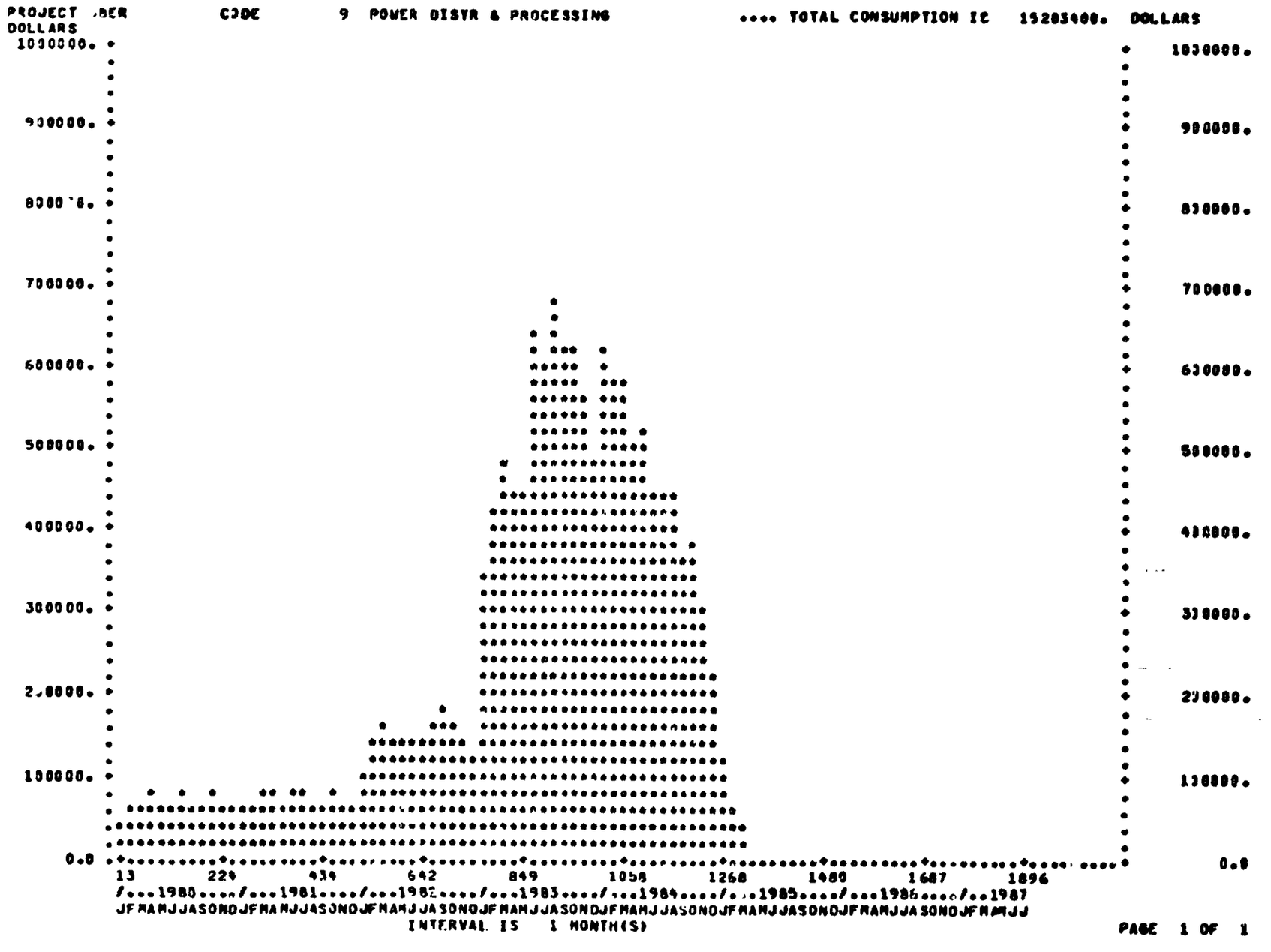
PROJECT GBER CODE 7 SPACE CONSTRUCTION



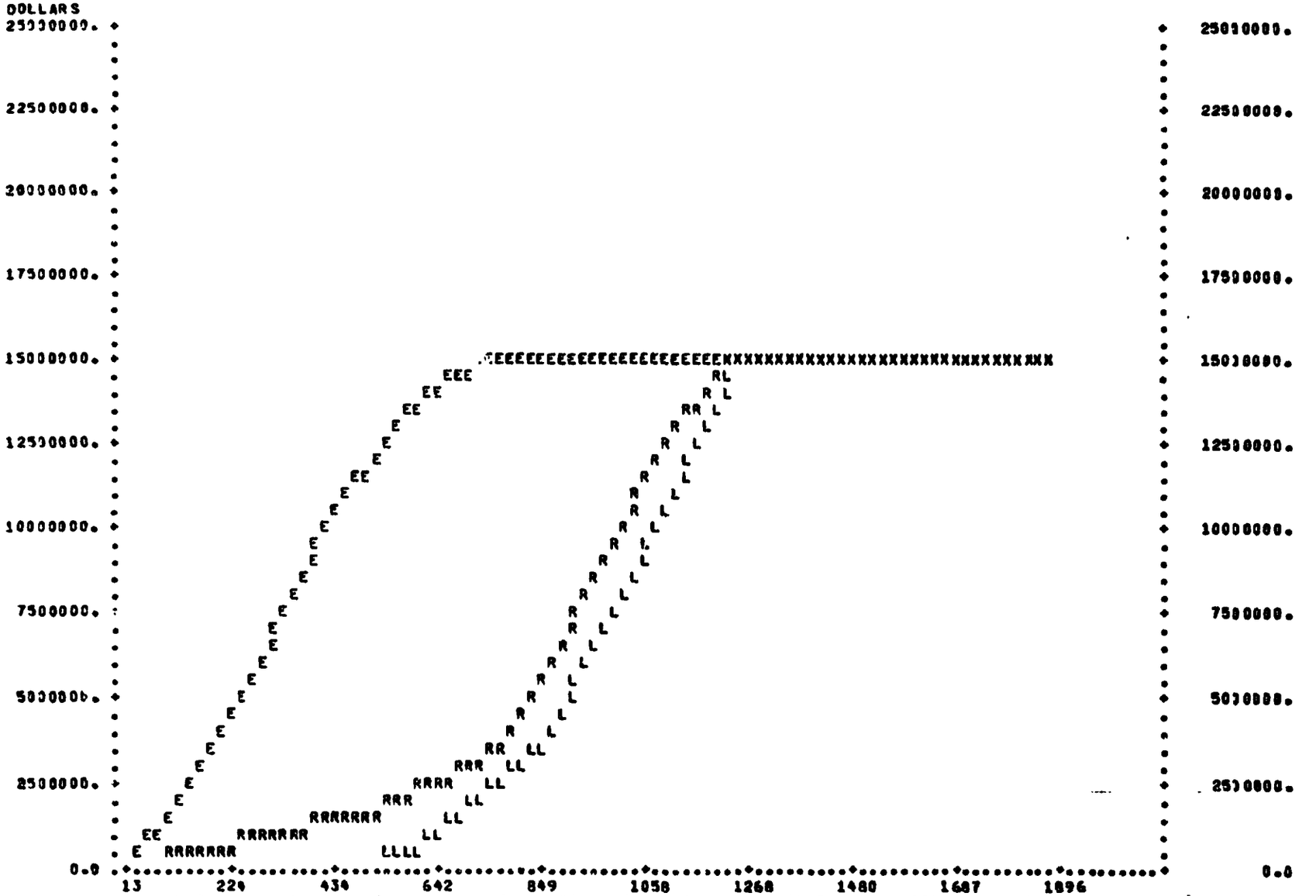

PROJECT 6BER CODE 8 SPACE TRANSPORTATION .... TOTAL CONSUMPTION IS 22935600. DOLLARS
DOLLARS
2500000.
2250000.
2000000.
1750000.
1500000.
1250000.
1000000.
750000.
500000.
250000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
1980 1981 1982 1983 1984 1985 1986 1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL 15 1 MONTH(S)

PROJECT SBLR CODE 8 SPACE TRANSPORTATION



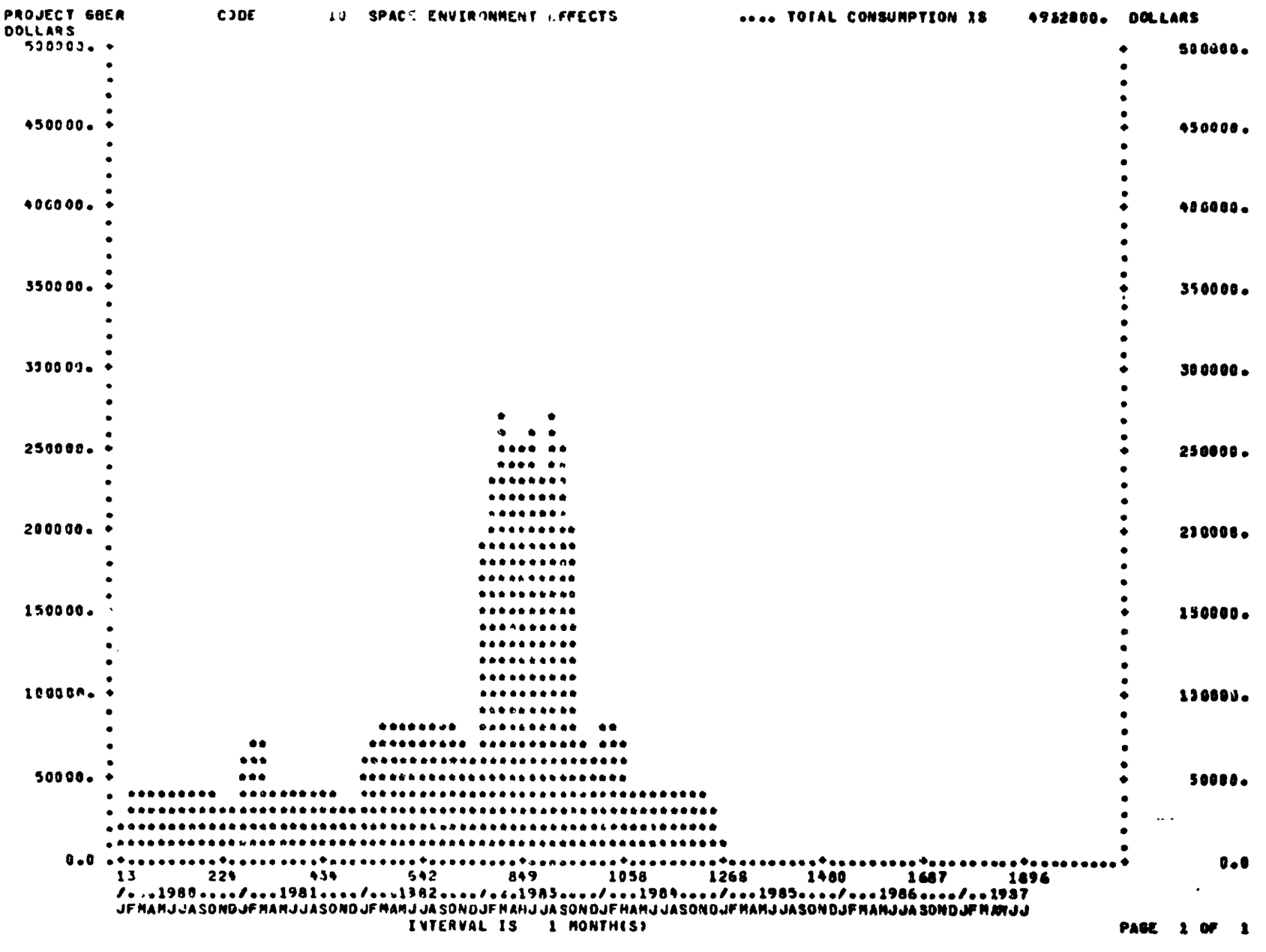

PROJECT BER CODE 9 POWER DISTR & PROCESSING .... TOTAL CONSUMPTION IS 15283400. DOLLARS
DOLLARS
1000000.
900000.
800000.
700000.
600000.
500000.
400000.
300000.
200000.
100000.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
1980
1981
1982
1983
1984
1985
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1

PROJE[illegible] GBER CODE 9 POWER DISTR & PROCESSING

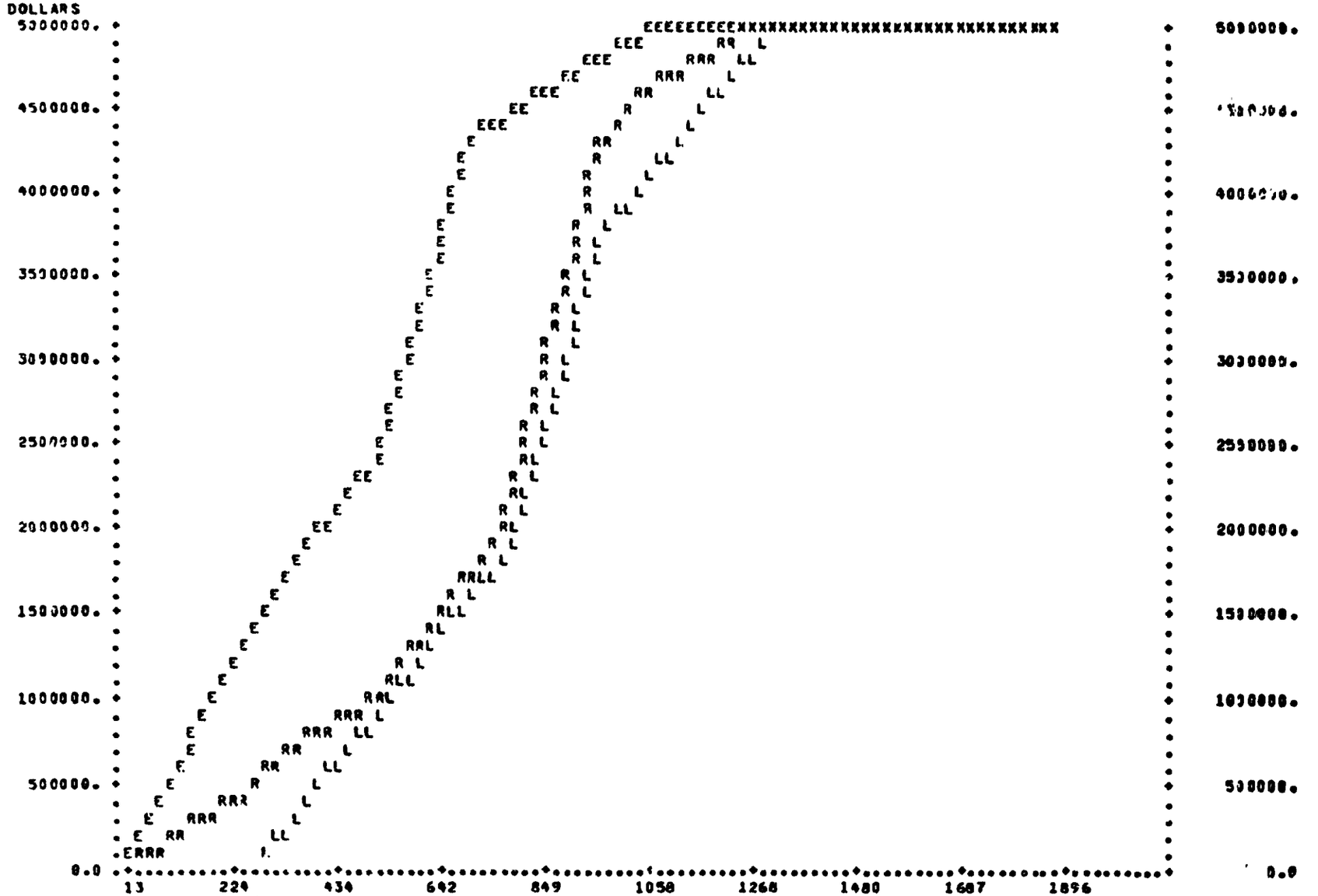


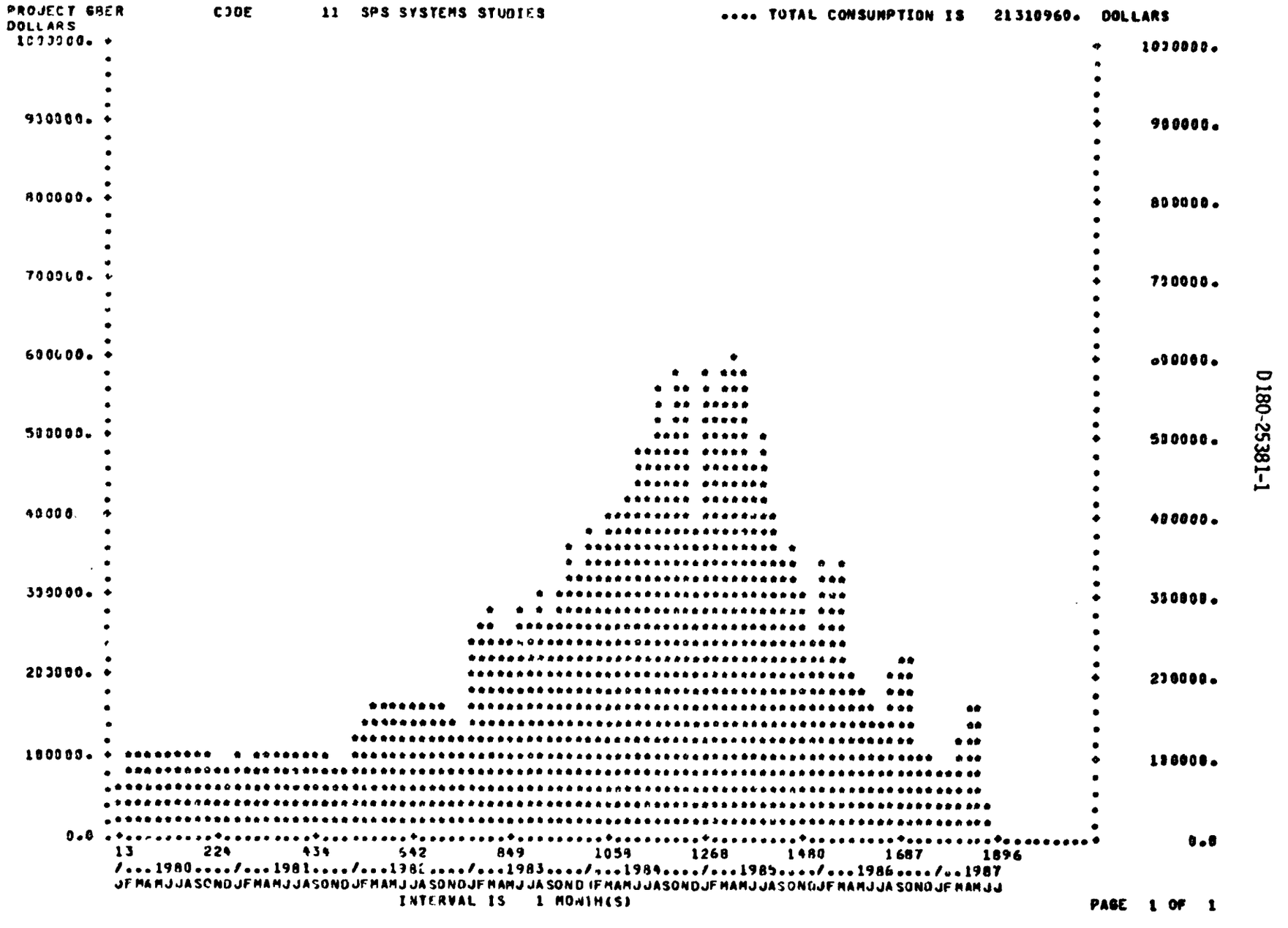
PAGE 1 OF 1

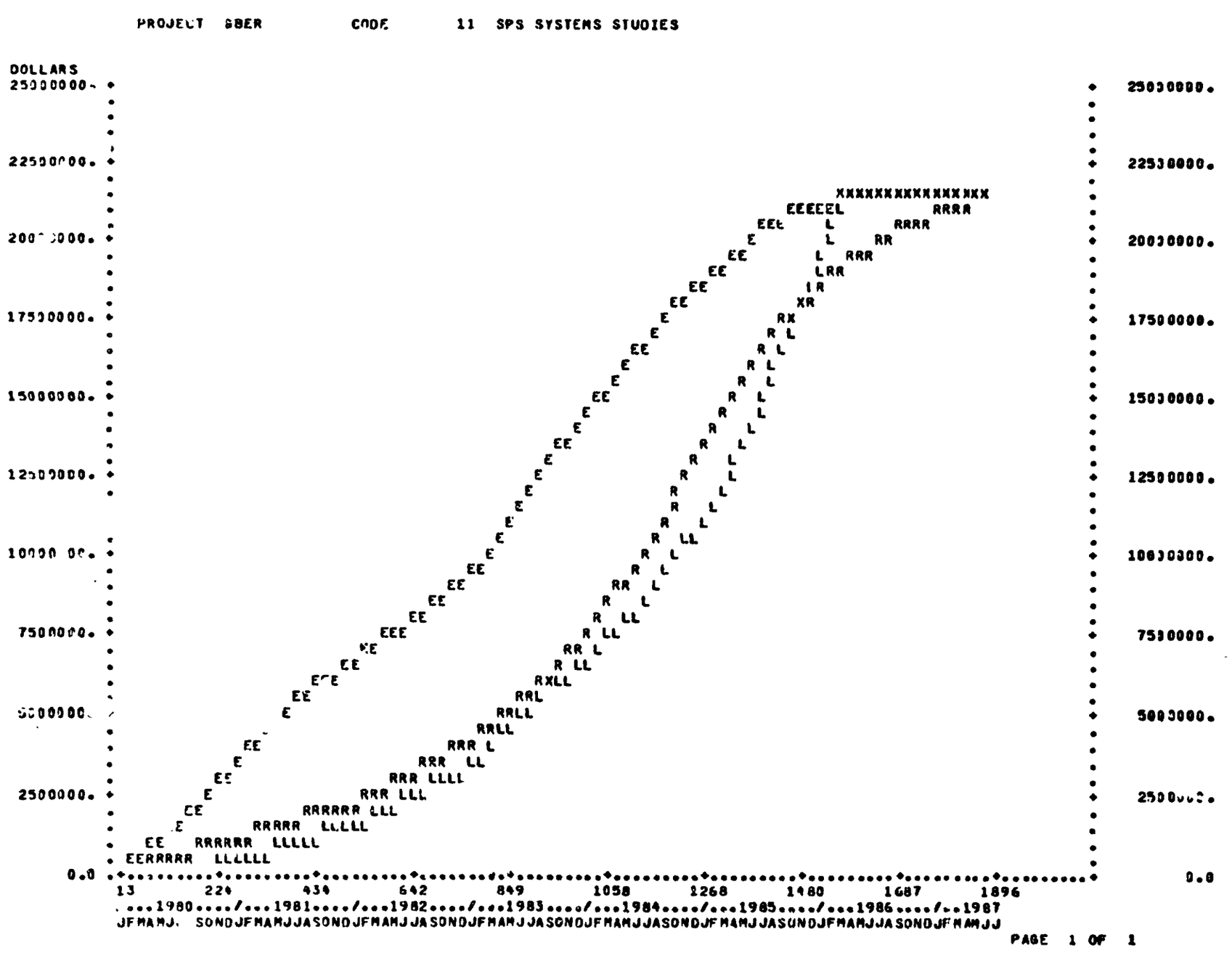
D180-25381-1

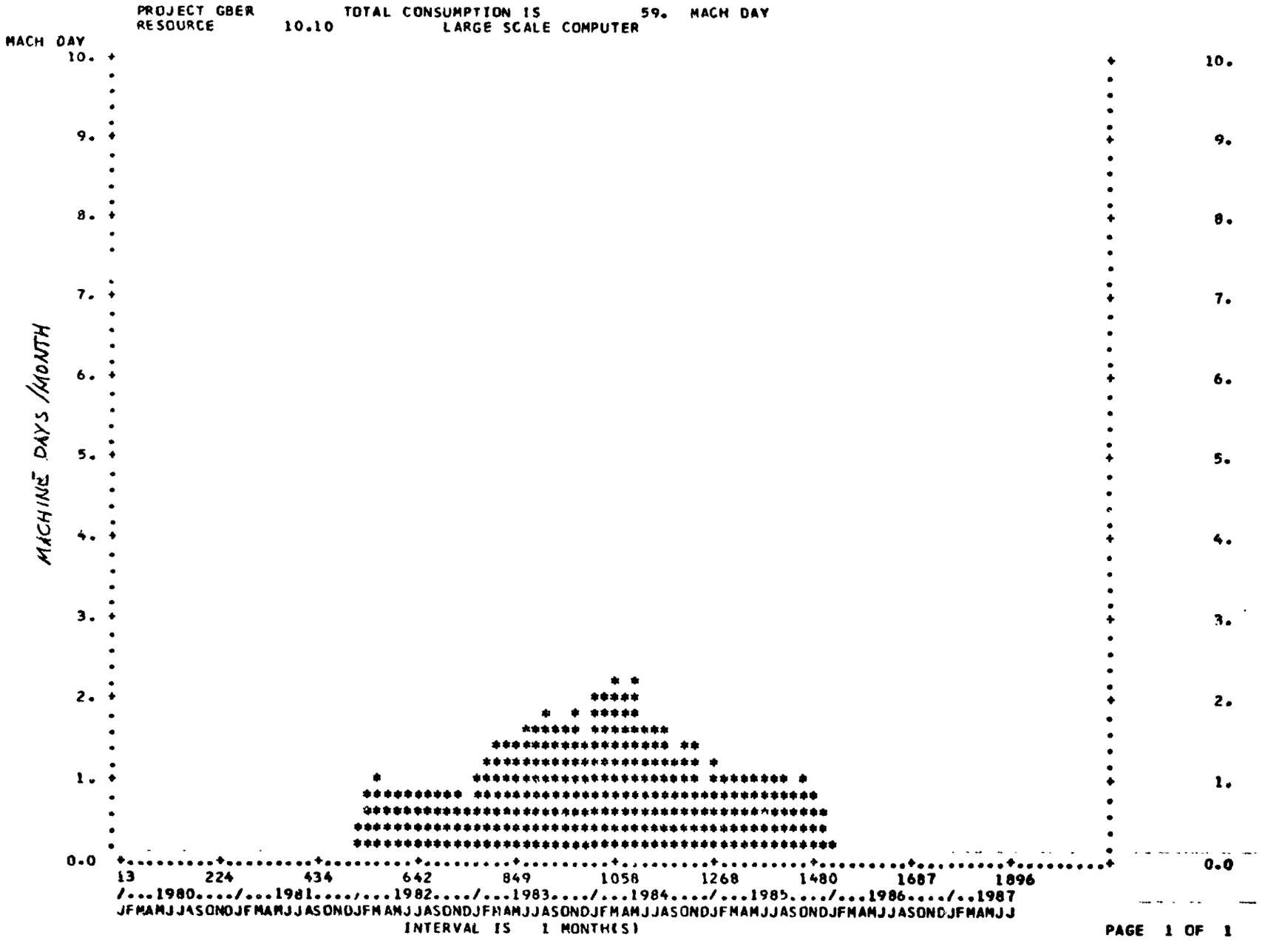

PROJECT 68ER CODE 10 SPACE ENVIRONMENT EFFECTS .... TOTAL CONSUMPTION IS 4952000. DOLLARS
DOLLARS
500000.
450000.
400000.
350000.
300000.
250000.
200000.
150000.
100000.
50000.
0.0
13
228
434
642
849
1058
1268
1480
1687
1896
/...1980....J/...1981....J/...1982....J/...1983....J/...1984....J/...1985....J/...1986....J/...1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1

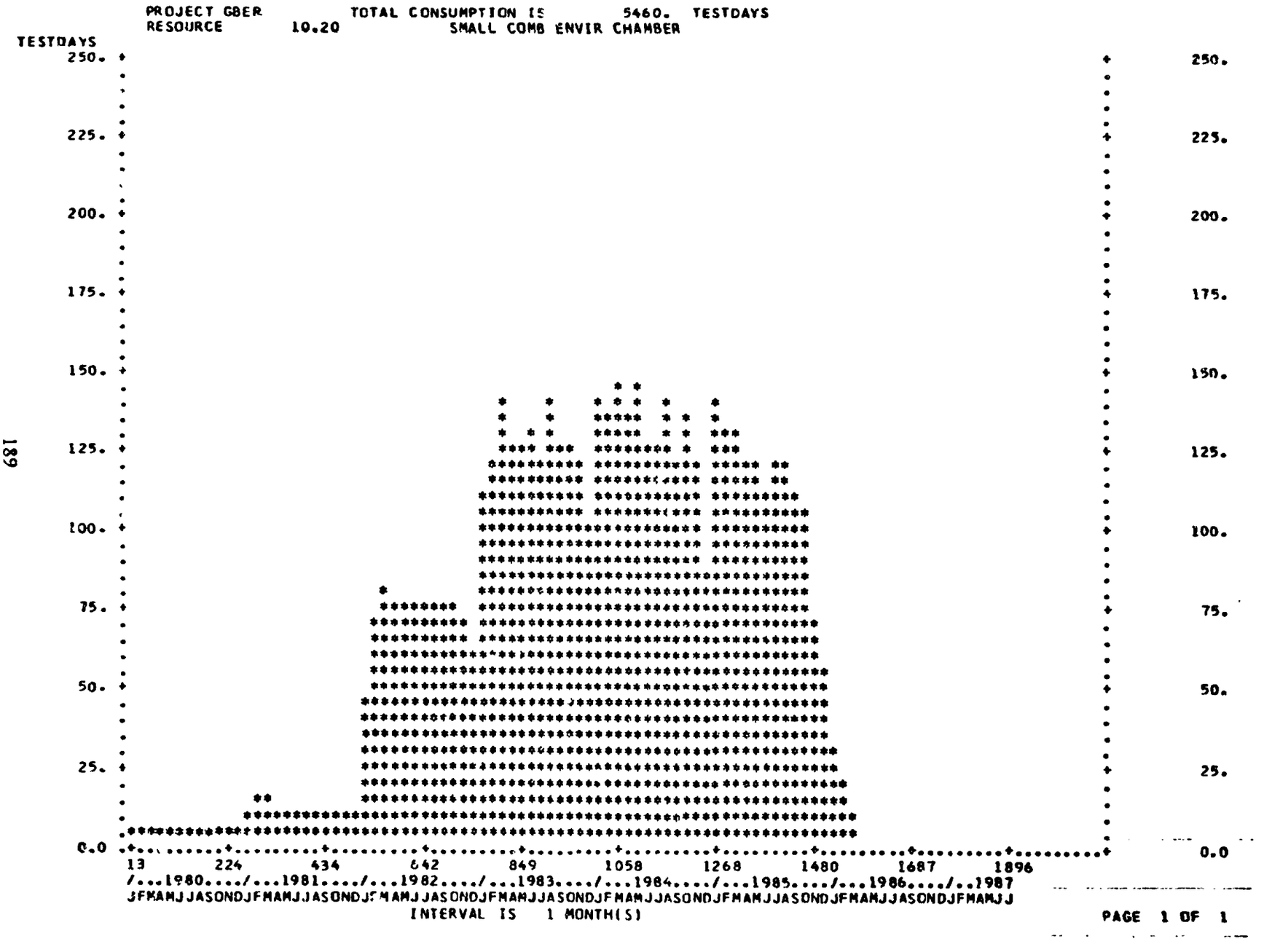
PROJECT GBER CODE 10 SPACE ENVIRONMENT EFFECTS




PROJECT GBER CODE 11 SPS SYSTEMS STUDIES .... TOTAL CONSUMPTION IS 21310960. DOLLARS
DOLLARS
1000000.
900000.
800000.
700000.
600000.
500000.
400000.
300000.
200000.
100000.
0.0
13 224 434 642 849 1059 1268 1480 1687 1896
/...1980....J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
INTERVAL IS 1 MONTH(S)
PAGE 1 OF 1

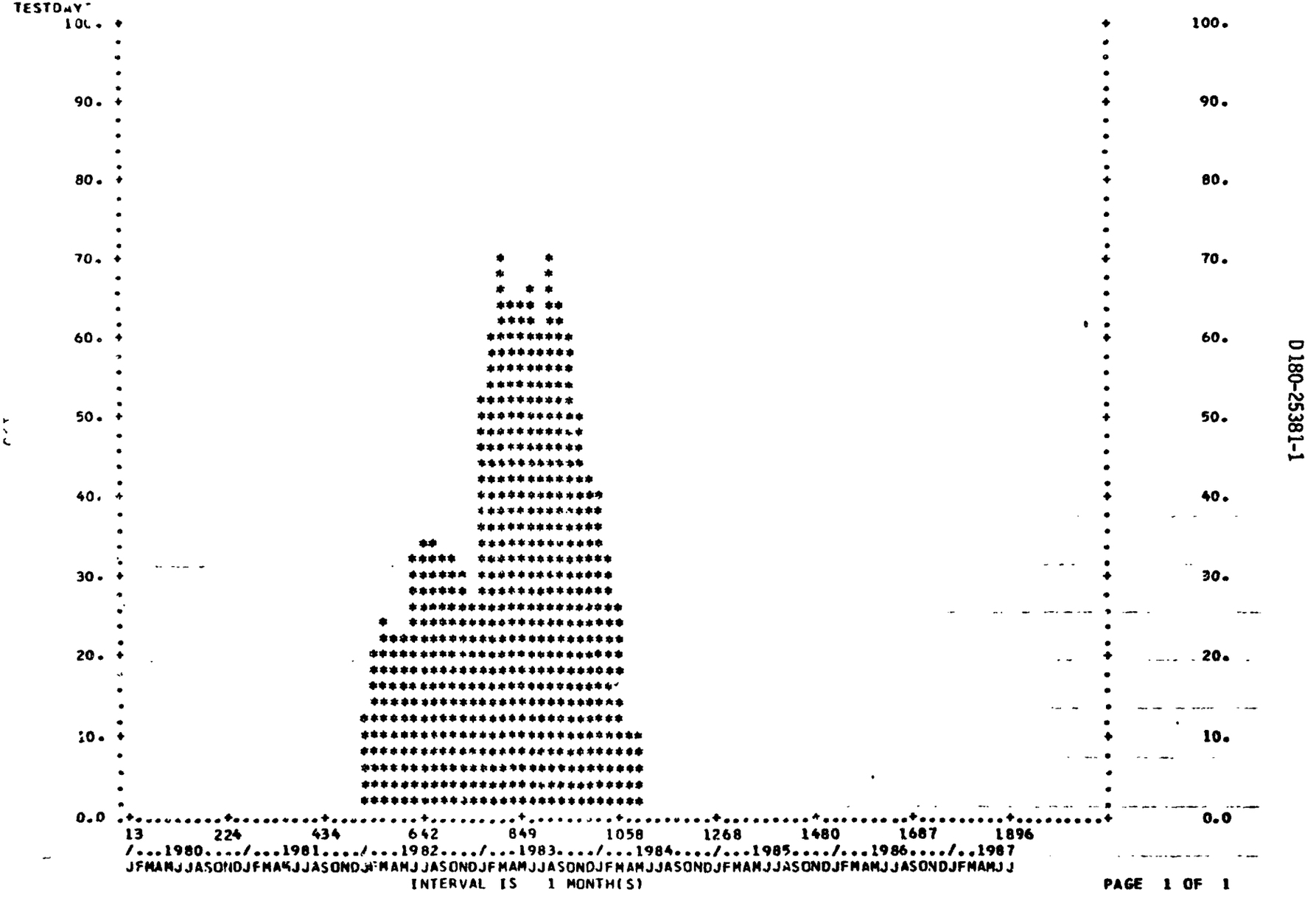

PROJECT GBER CODE 11 SPS SYSTEMS STUDIES
DOLLARS
25000000.
22500000.
20000000.
17500000.
15000000.
12500000.
10000000.
7500000.
5000000.
2500000.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
1980 1981 1982 1983 1984 1985 1986 1987
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
PAGE 1 OF 1


PROJECT GBER TOTAL CONSUMPTION IS 59. MACH DAY
RESOURCE 10.10 LARGE SCALE COMPUTER
MACH DAY
MACHINE DAYS /MONTH
10.
9.
8.
7.
6.
5.
4.
3.
2.
1.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)


PROJECT GBER TOTAL CONSUMPTION IS 5460. TESTDAYS
RESOURCE 10.20 SMALL COMB ENVIR CHAMBER
TESTDAYS
250.
225.
200.
175.
150.
125.
100.
75.
50.
25.
0.0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)

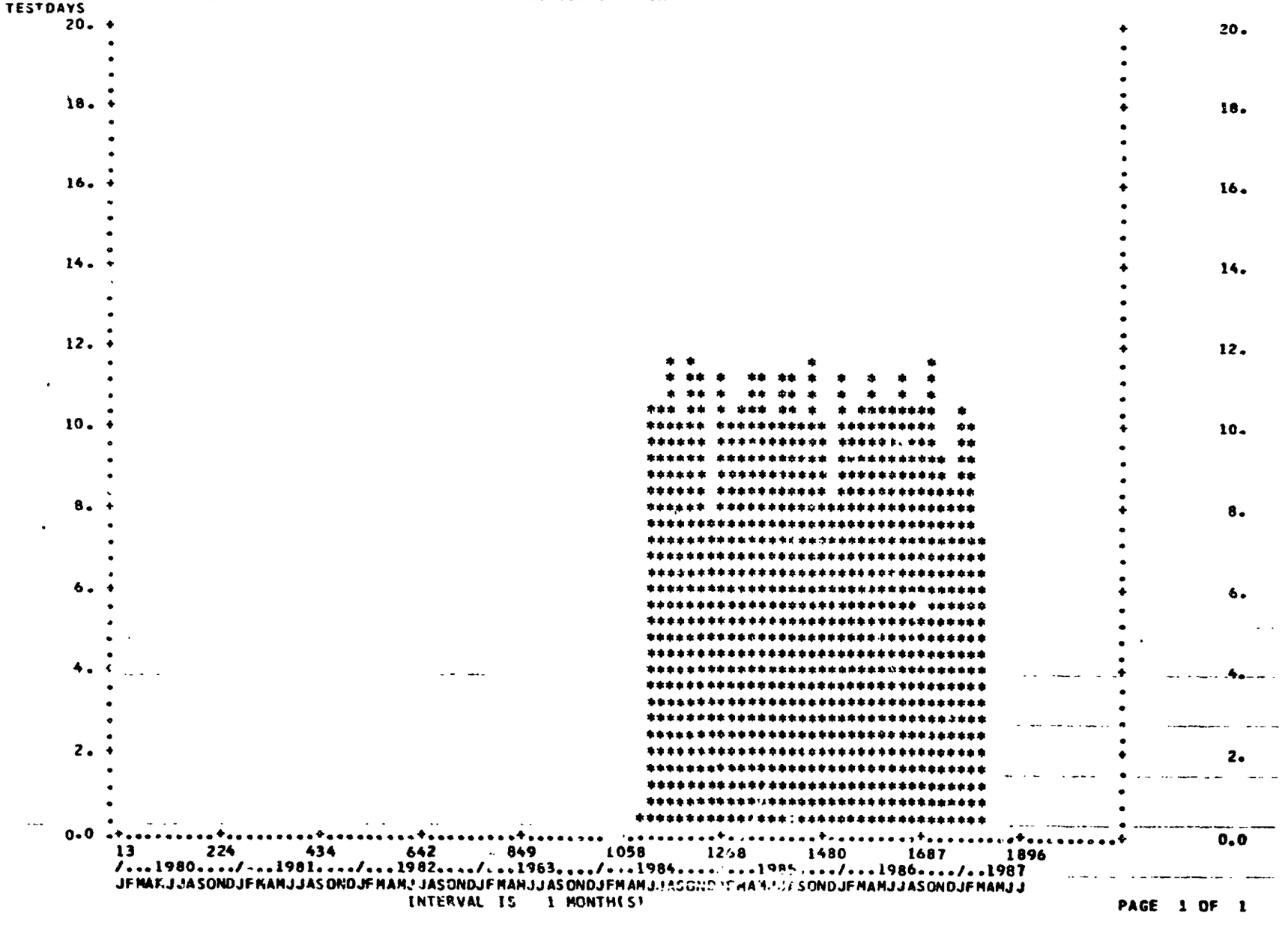
D180-25381-1

PROJECT GBER TOTAL CONSUMPTION IS 1150. TESTDAYS
RESOURCE 10.30 LARGE COMB ENVIR CHAMBER

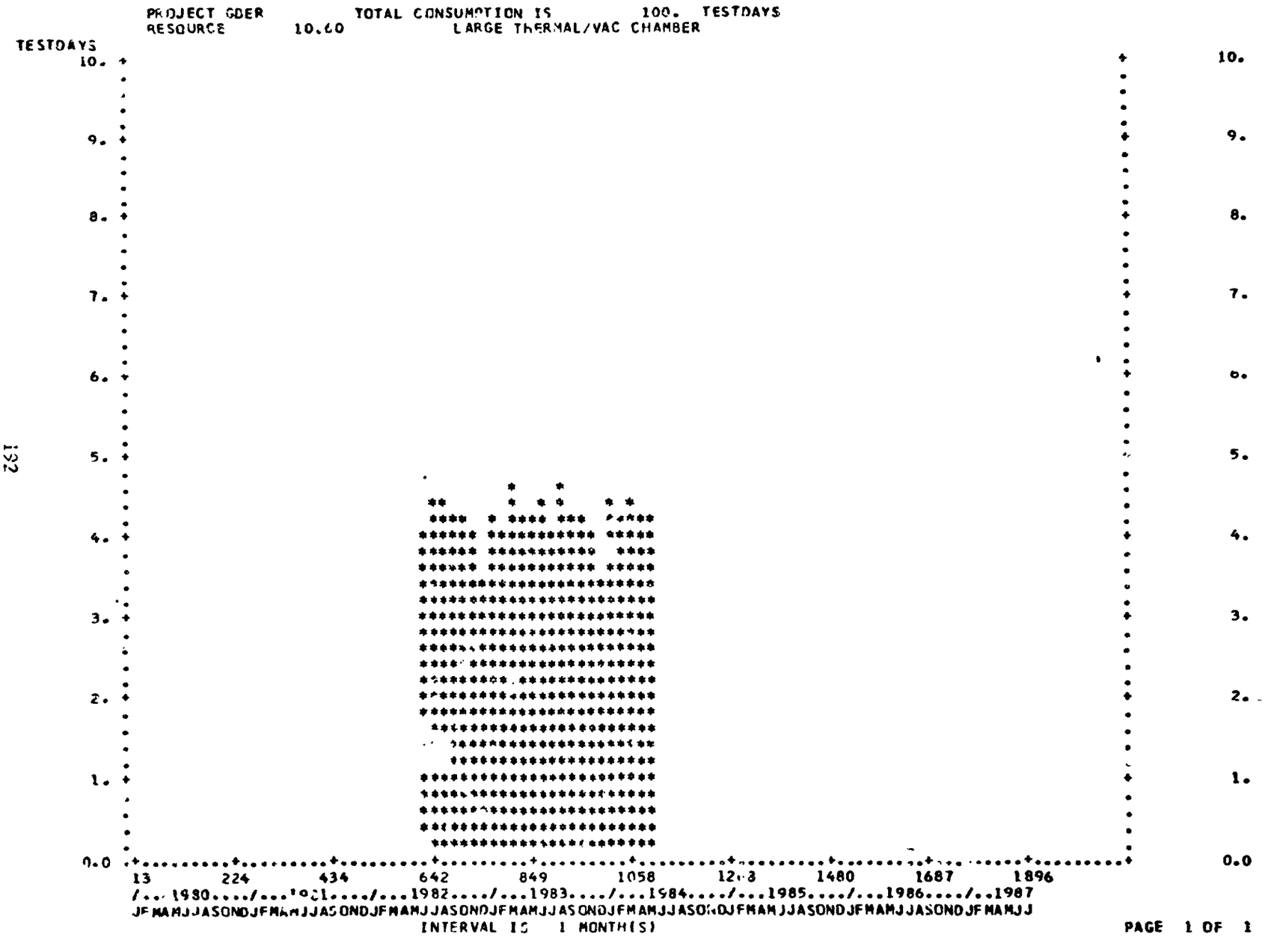


D180-25381-1

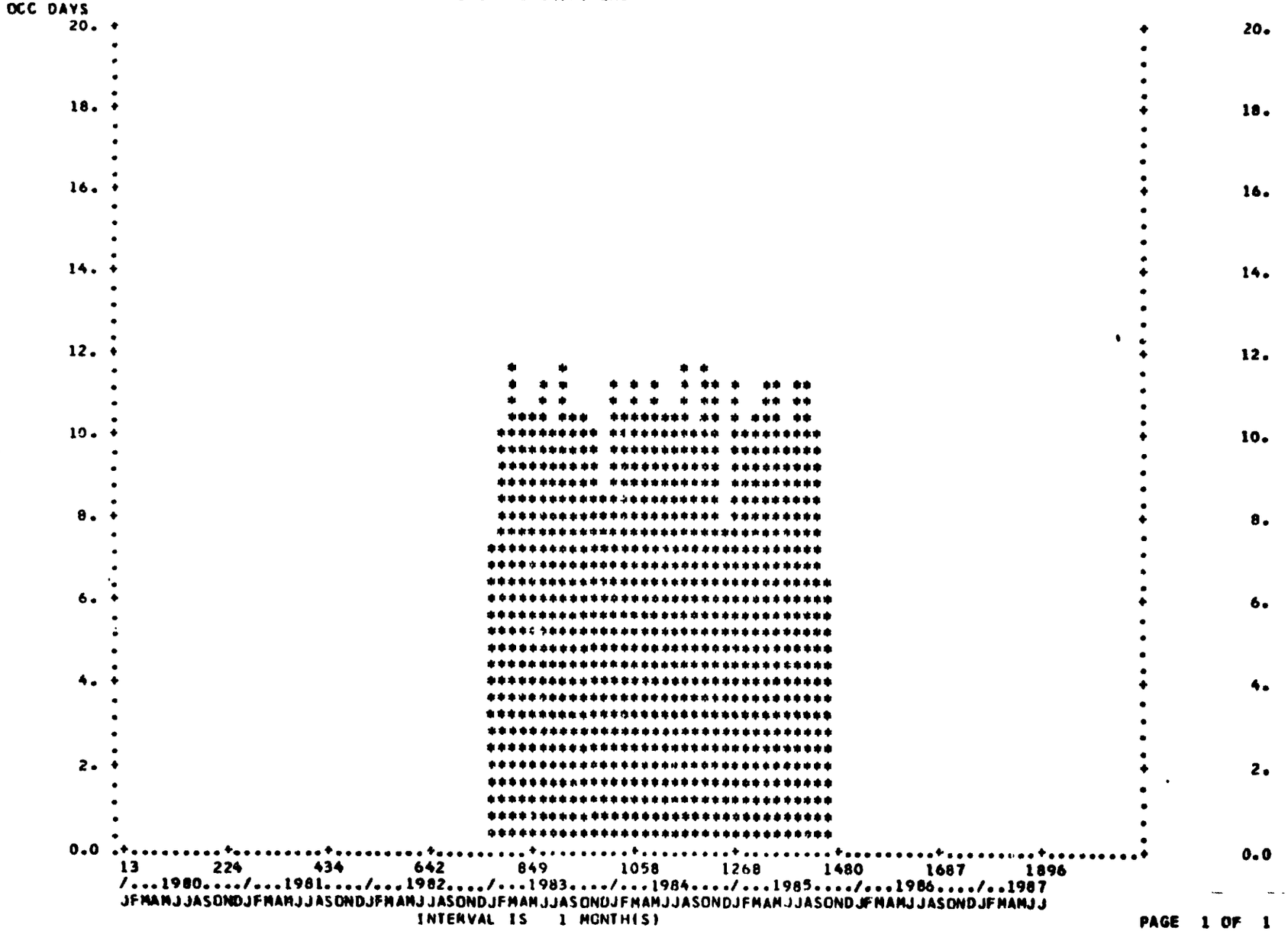
PROJECT GBER TOTAL CONSUMPTION IS 350. TESTDAYS
RESOURCE 10.50 LARGE ANECHOIC CHAMBER

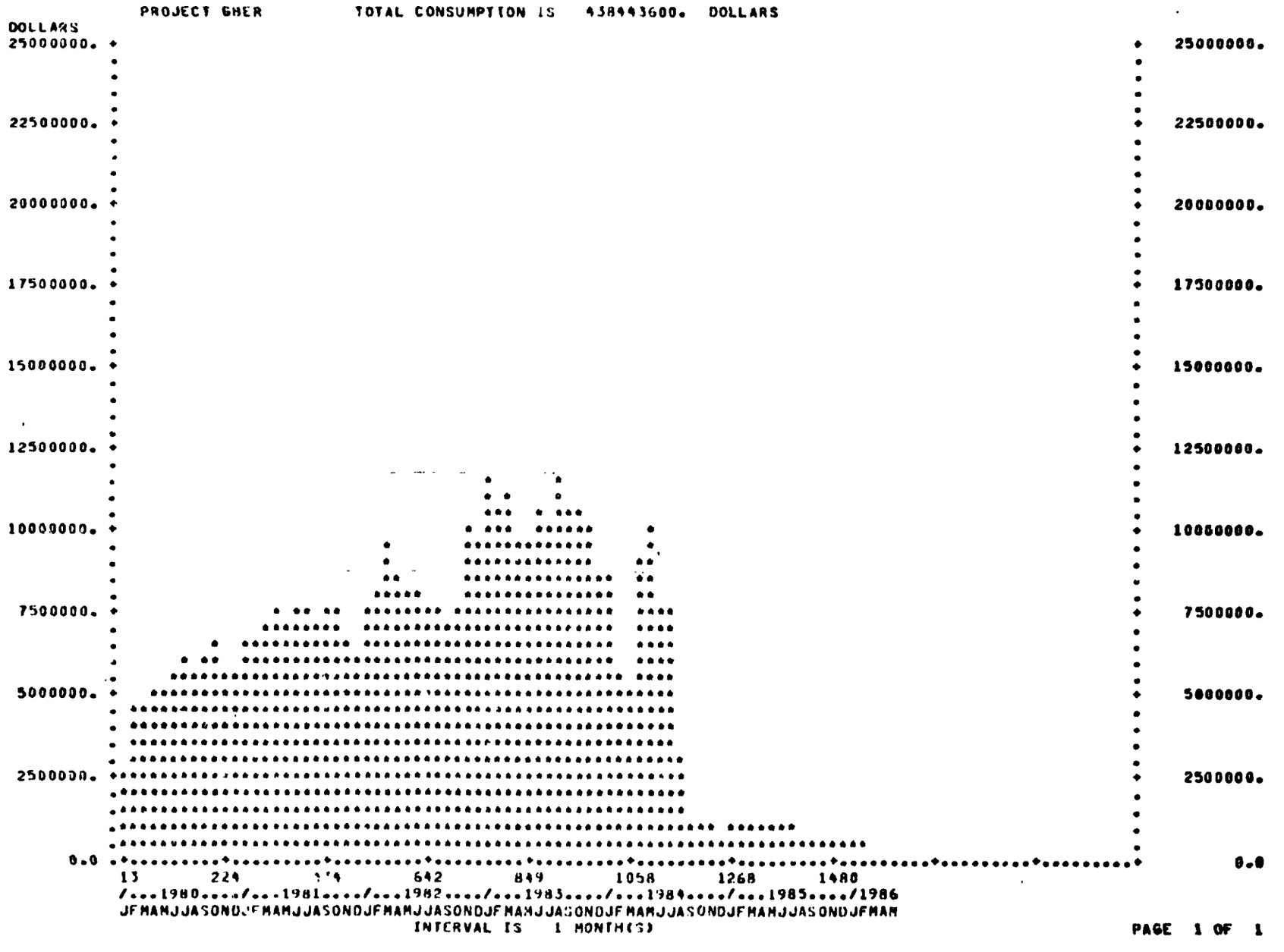


D180-25381-1


PROJECT GDER TOTAL CONSUMPTION IS 100. TESTDAYS
RESOURCE 10.60 LARGE THERMAL/VAC CHAMBER
TESTDAYS
10.
9.
8.
7.
6.
5.
4.
3.
2.
1.
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../...1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
INTERVAL IS 1 MONTH(S)

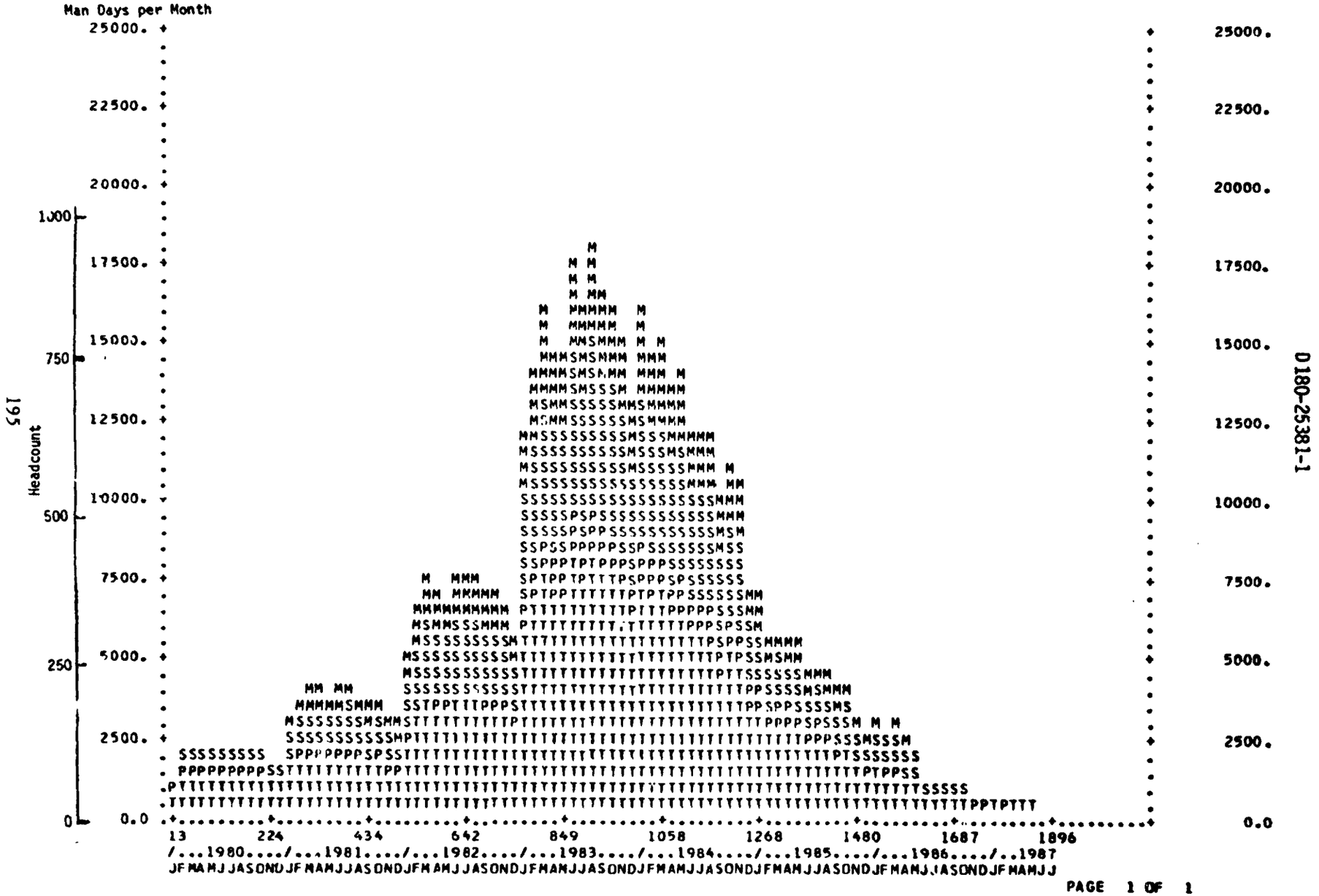
PROJECT GBER TOTAL CONSUMPTION IS 350. OCC DAYS
RESOURCE 10.70 SYSTEMS INTFG LAB




PROJECT GHER TOTAL CONSUMPTION IS 438443600. DOLLARS
DOLLARS
25000000.
22500000.
20000000.
17500000.
15000000.
12500000.
10000000.
7500000.
5000000.
2500000.
0.0
13
224
642
849
1058
1268
1480
/1980/1981/1982/1983/1984/1985/1986
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAM
INTERVAL IS 1 MONTH(S)

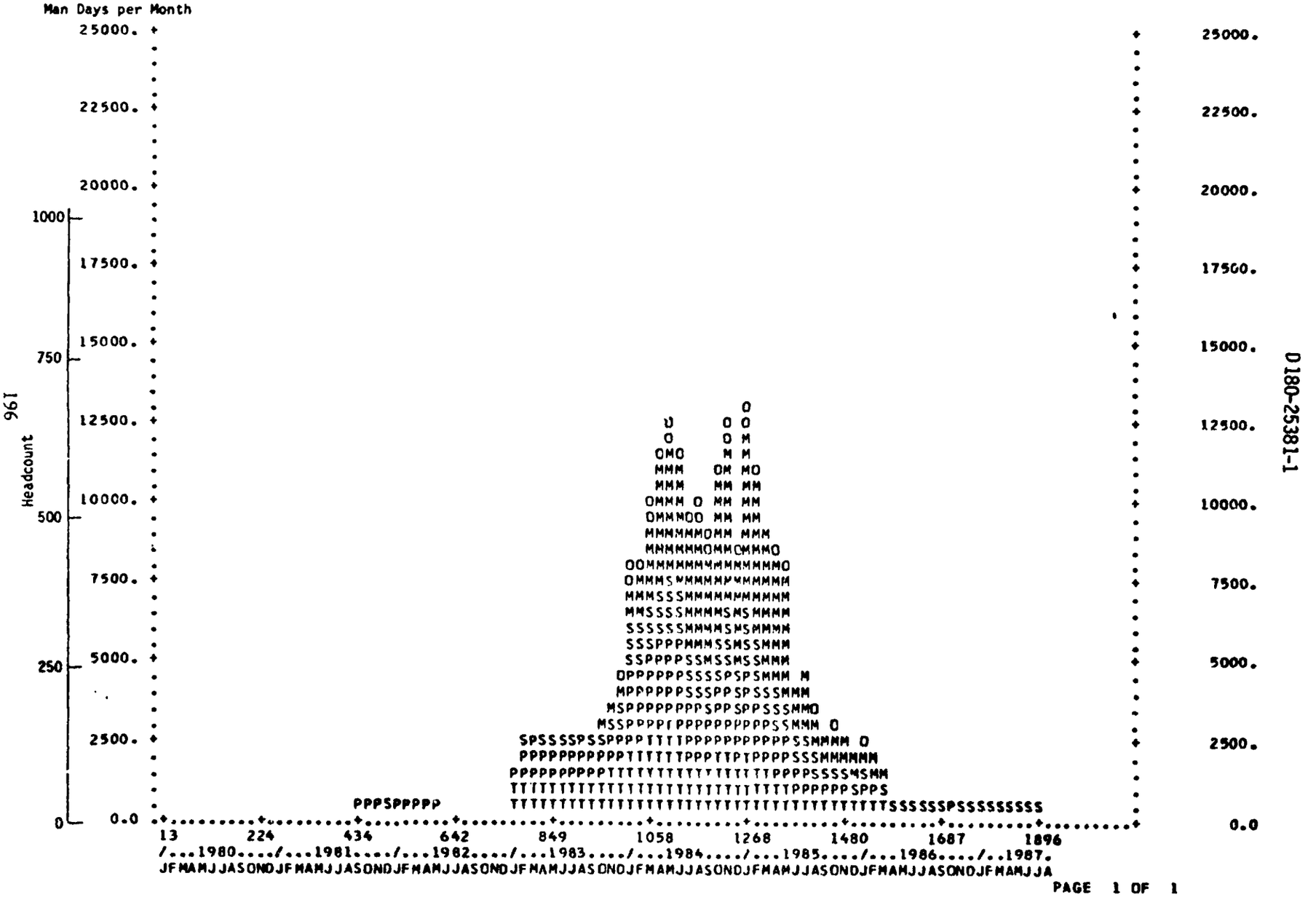
D180-25381-1

PROJECT GBER GROUND-BASED PROGRAM



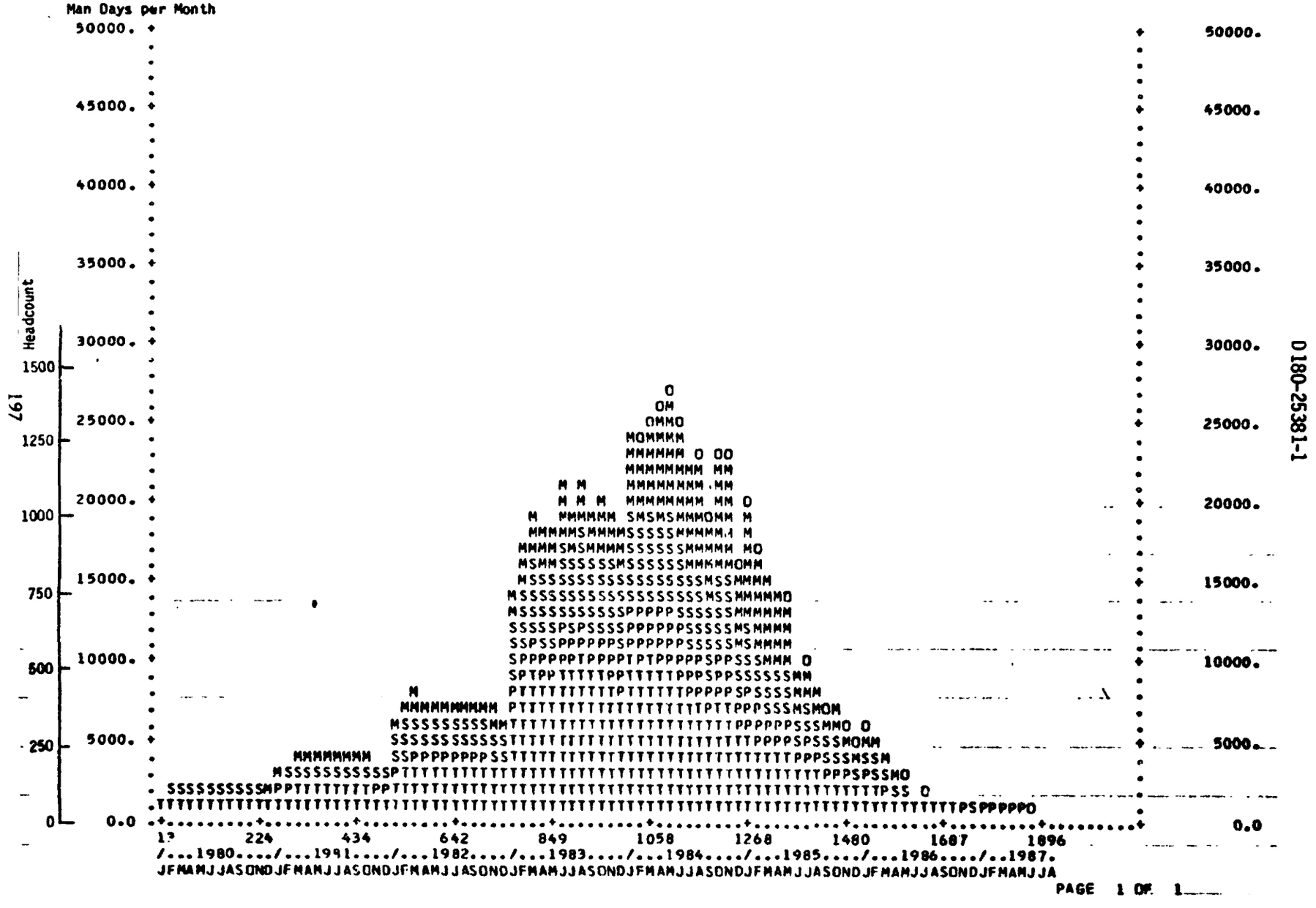
0180-25381-1

PROJECT GBER FLIGHT RESEARCH PROGRAM

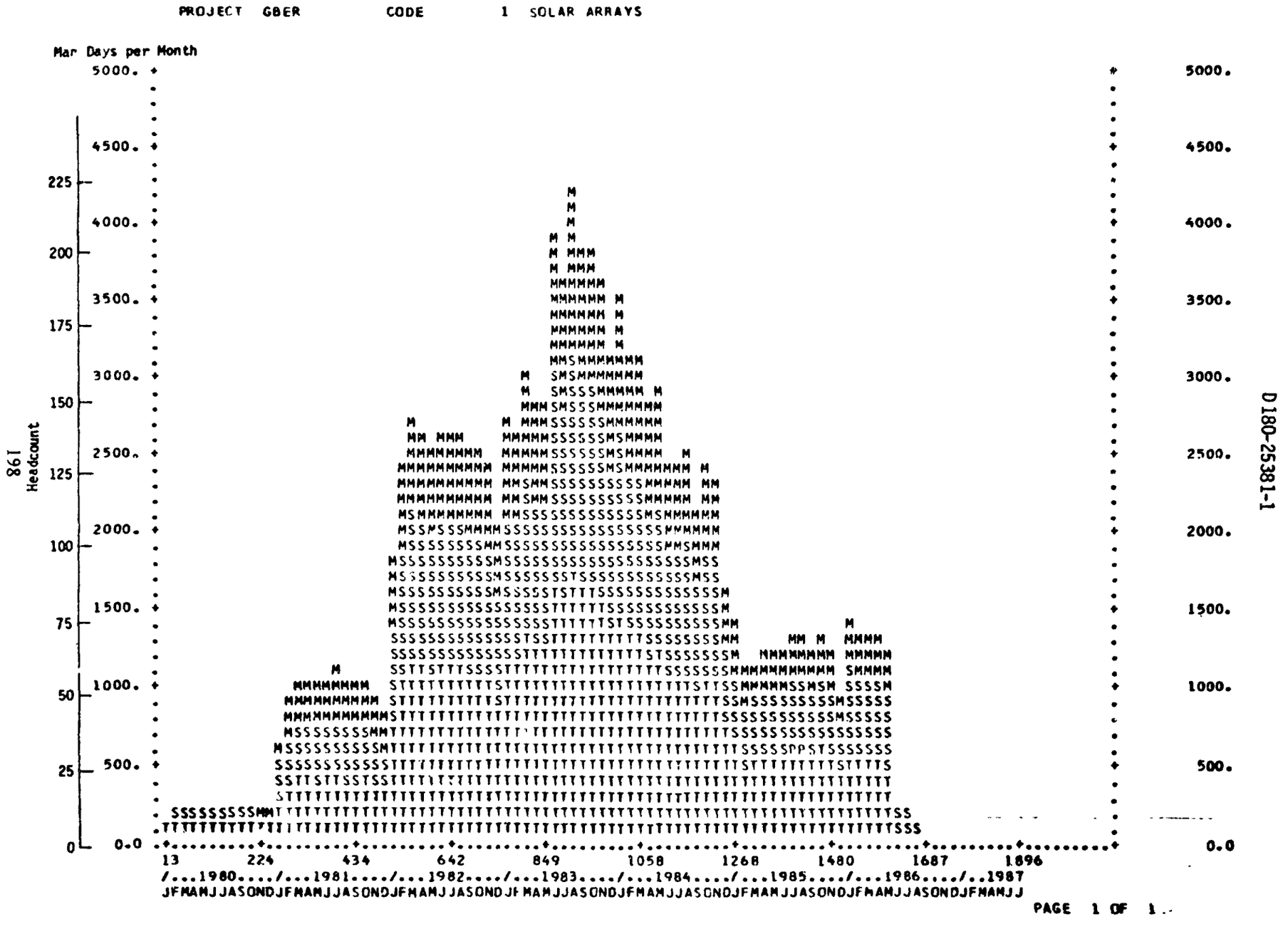


D180-25381-1

PROJECT GBER GROUND & FLIGHT RESEARCH TOTALS

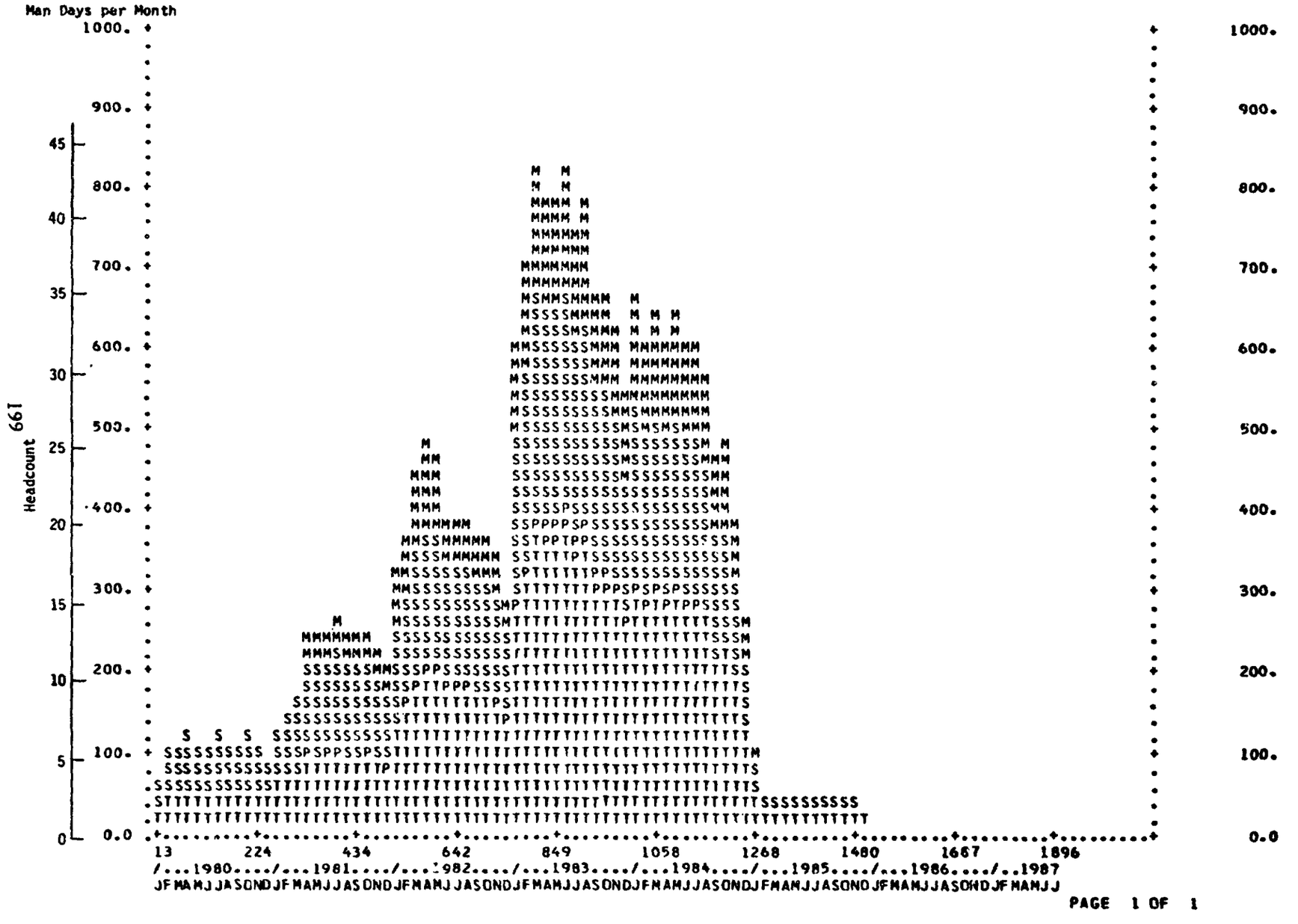


0180-25381-1

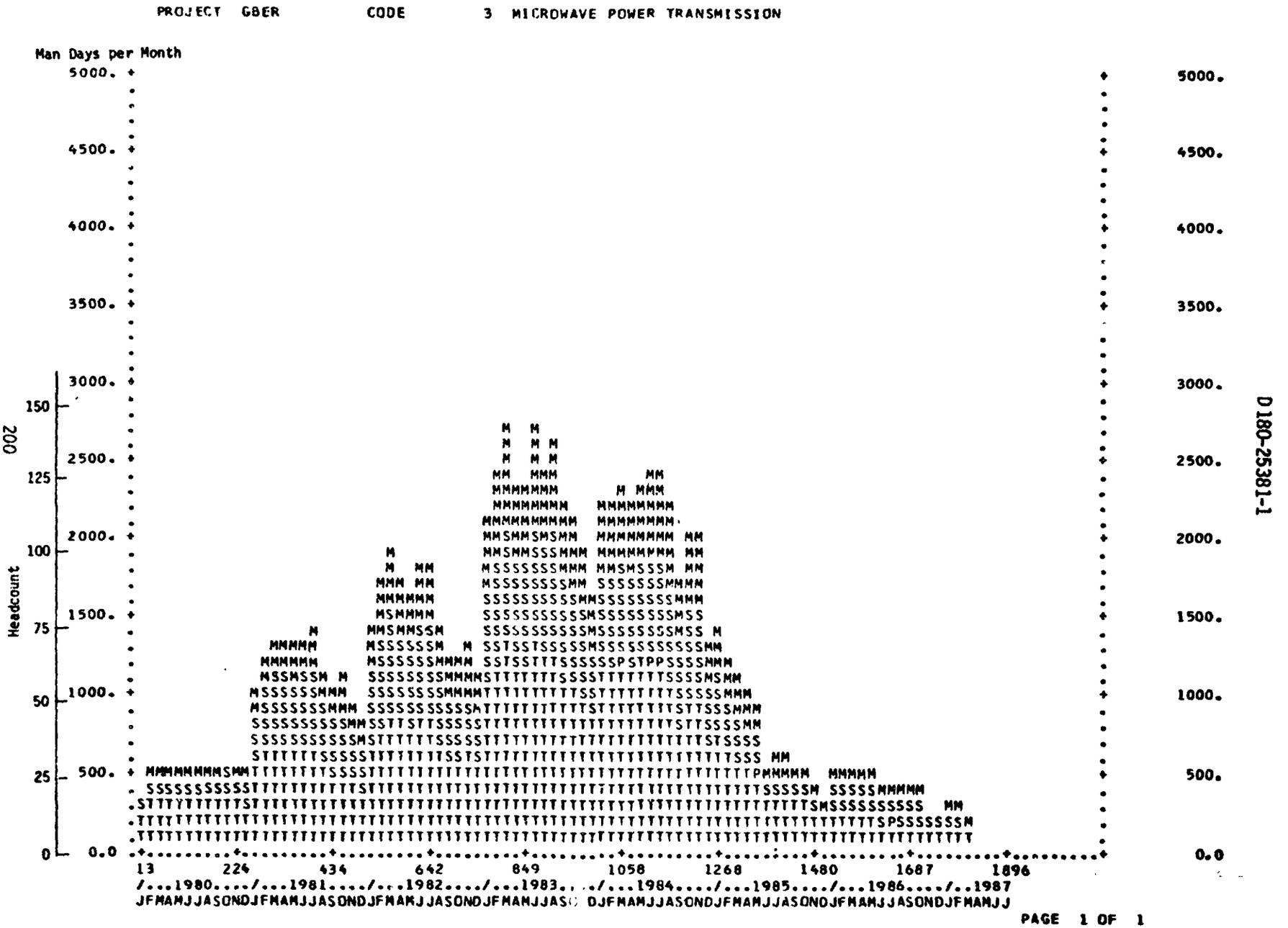

PROJECT GBER CODE 1 SOLAR ARRAYS
Mar Days per Month
Headcount
198
5000.
4500.
4000.
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.0
225
200
175
150
125
100
75
50
25
0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ

D180-25381-1

PROJECT GBER CODE 2 THERMAL ENGINES & SYSTEMS

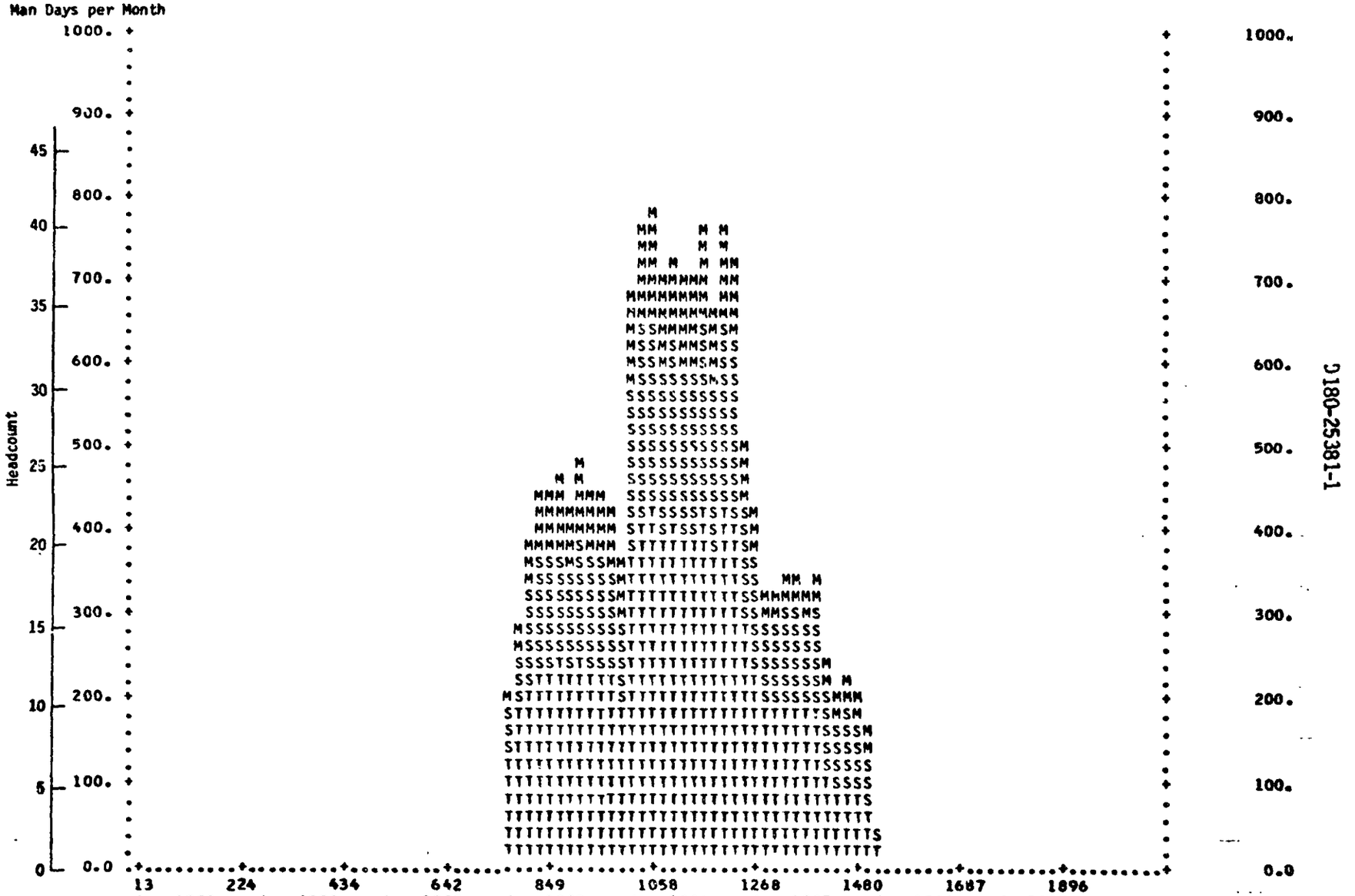


D180-25381-1


PROJECT GBER CODE 3 MICROWAVE POWER TRANSMISSION
Man Days per Month
Headcount
5000.
4500.
4000.
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.0
200
150
125
100
75
50
25
0
13
224
434
642
849
1058
1268
1480
1687
1896
1980
1981
1982
1983
1984
1985
1986
1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ

D180-25381-1

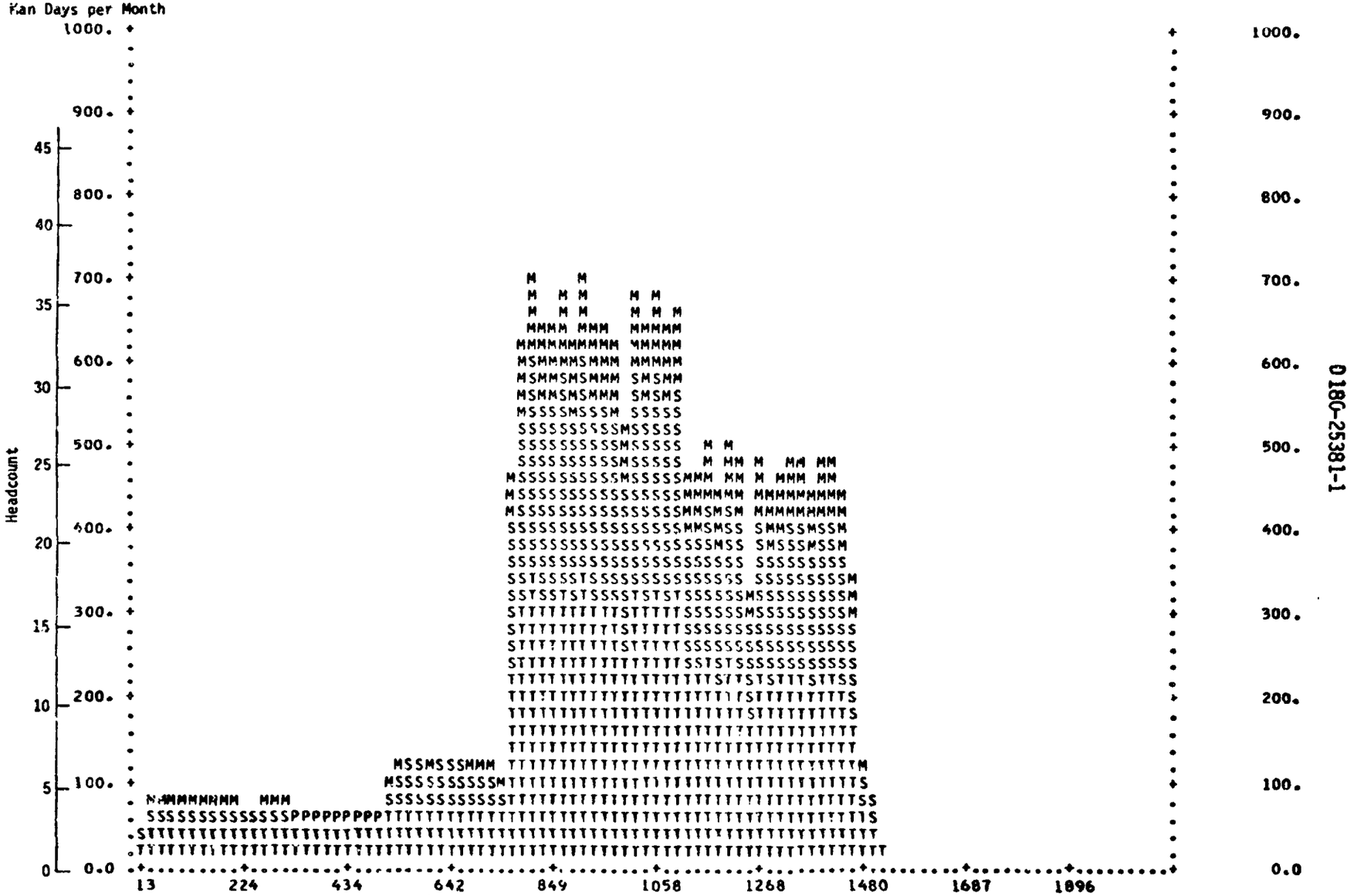
PROJECT GBER CODE 4 STRUCTURES & DYNAMICS



201

D180-25381-1

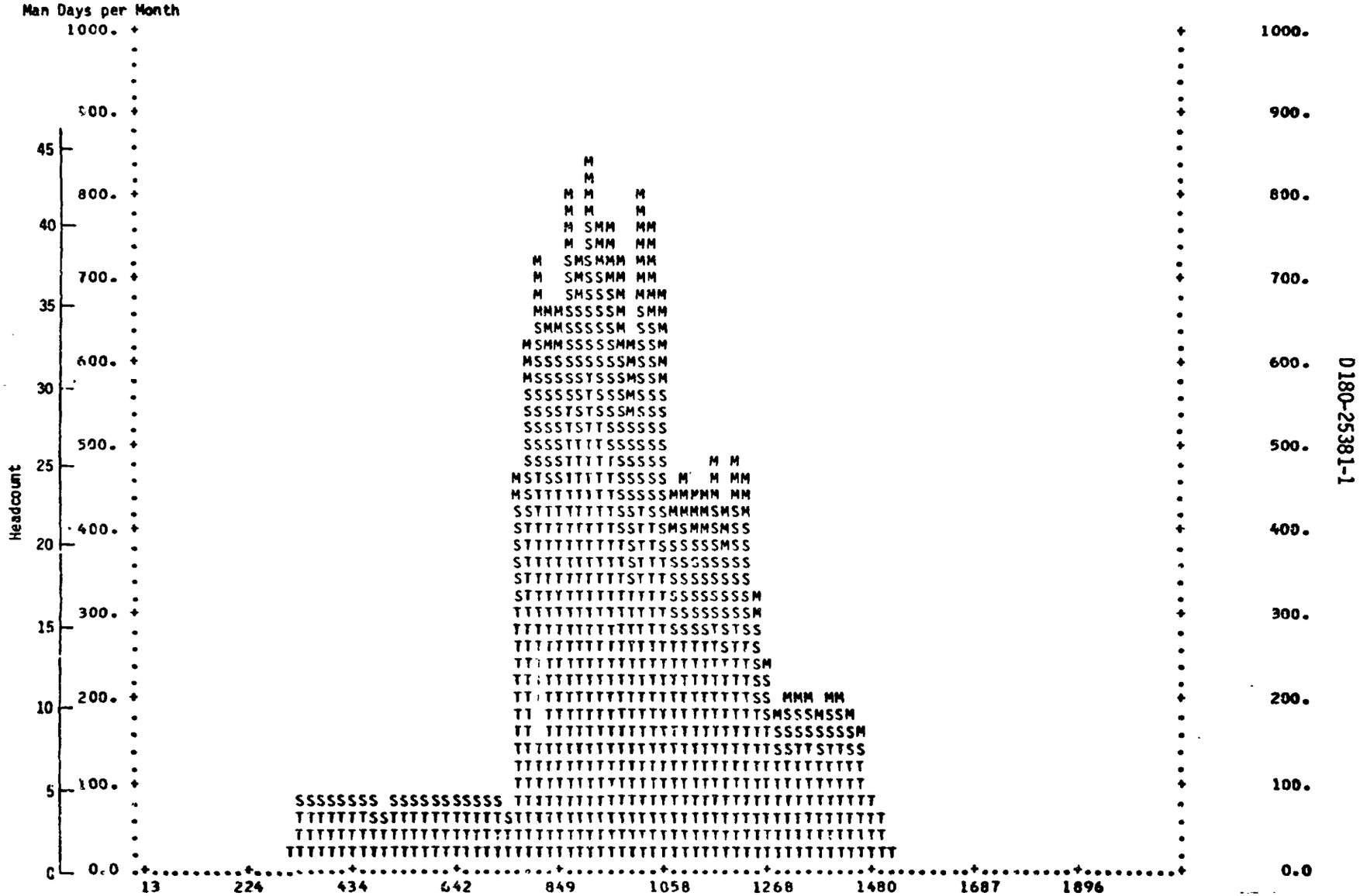
PROJECT GBER CODE 5 MATERIALS



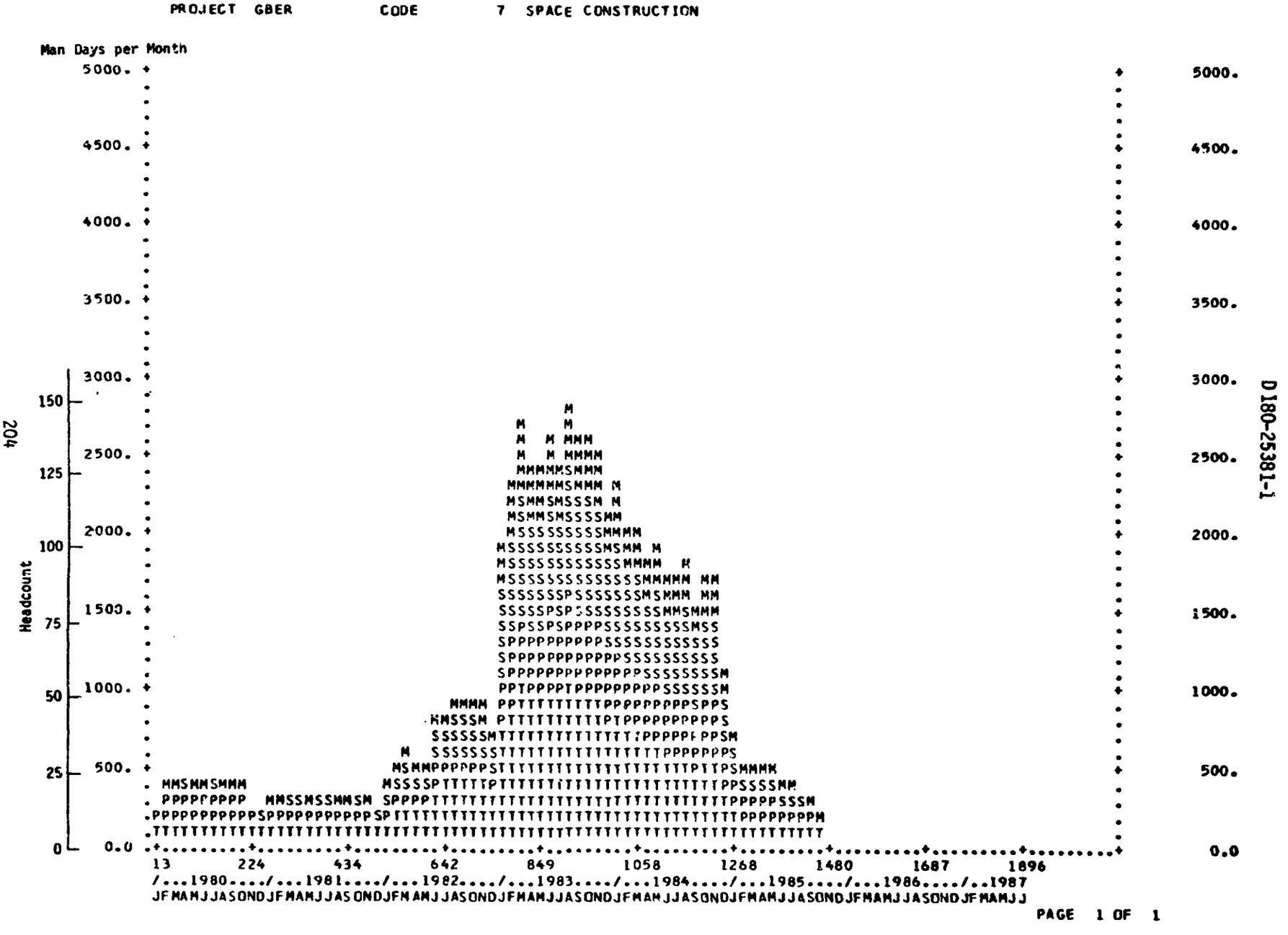
0180-25381-1

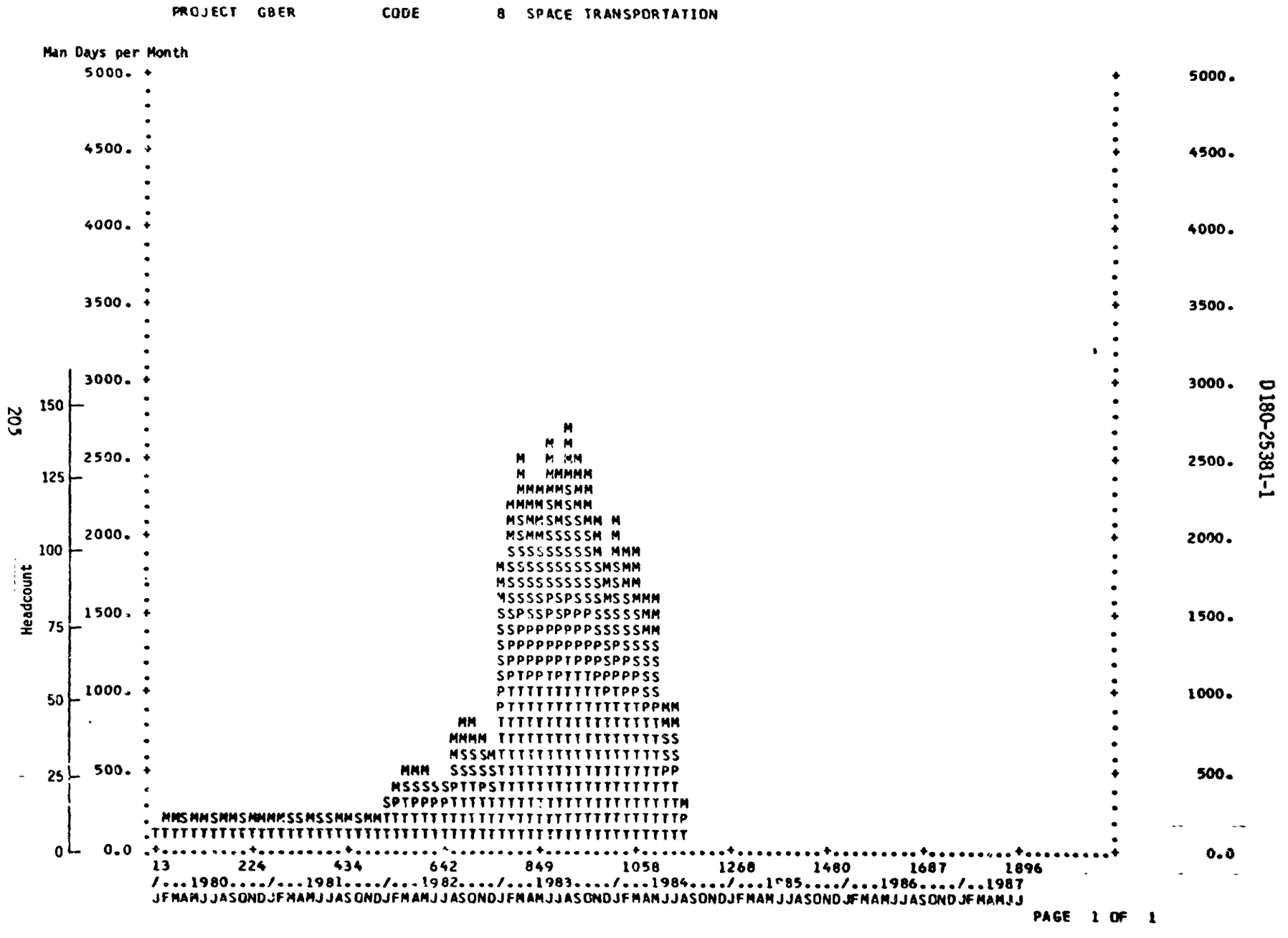
202

PROJECT GBER CODE 6 FLIGHT CONTROLS & SYSTEM CONTROL

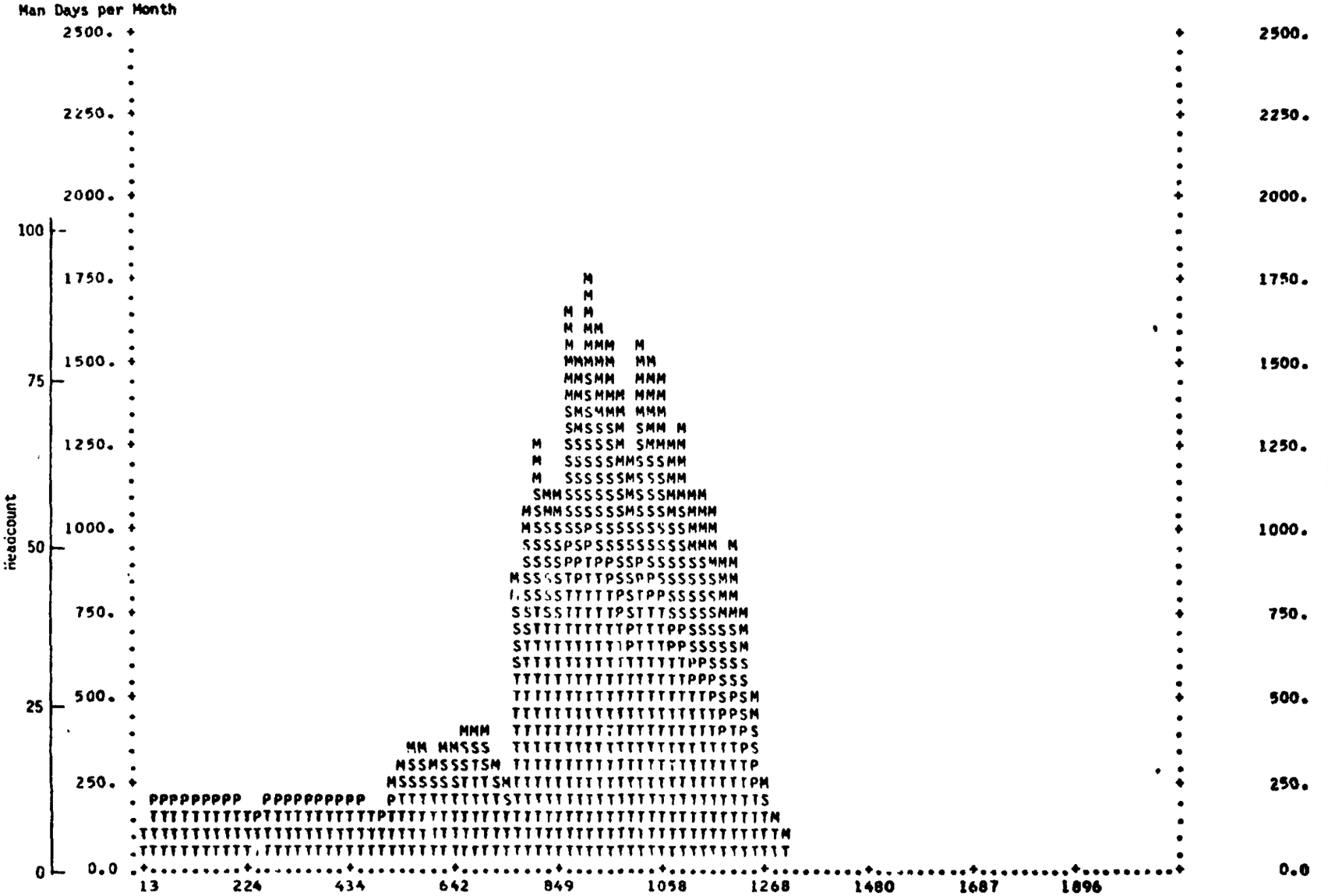


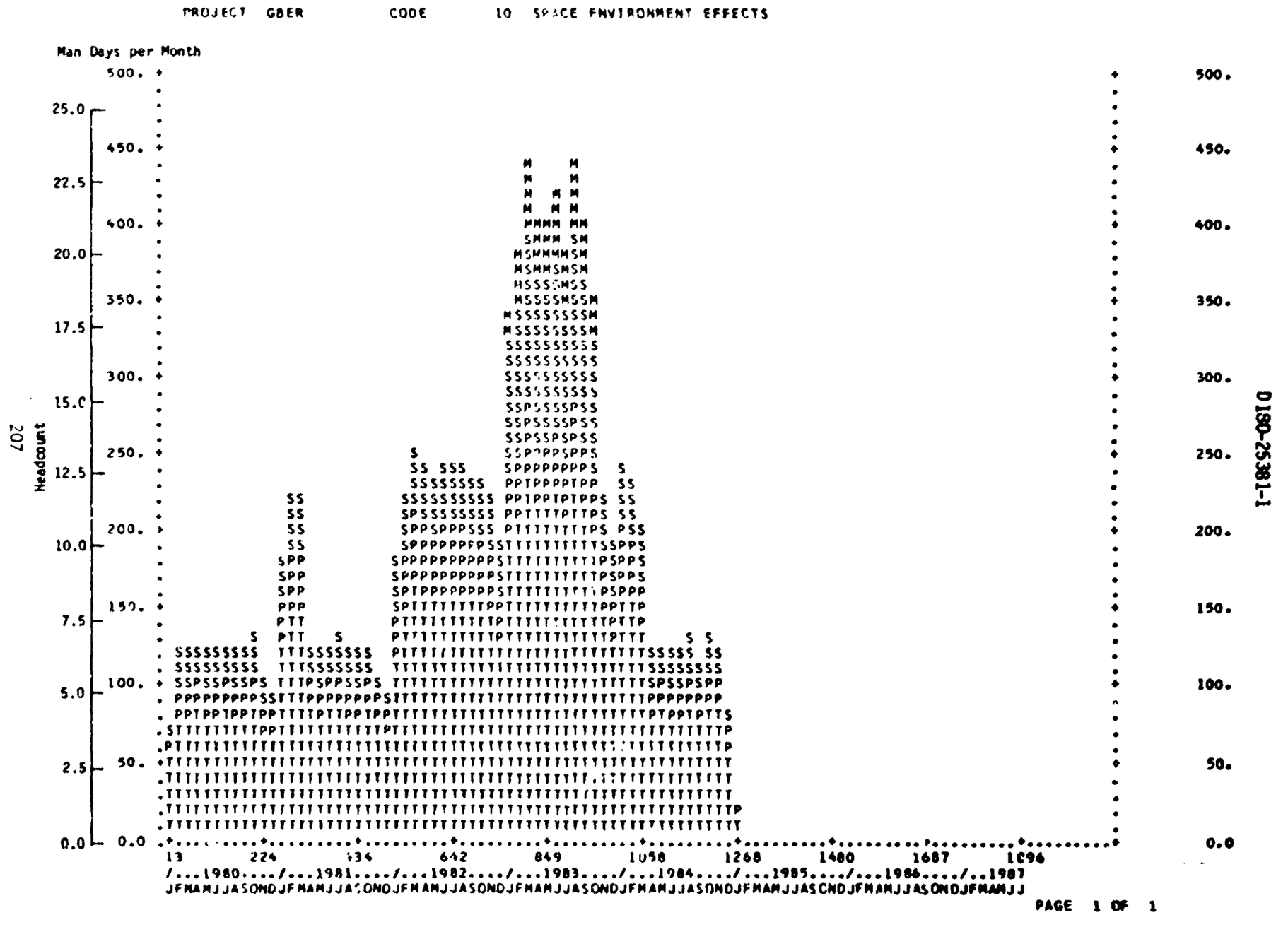
PAGE 1 OF 1


PROJECT GBER CODE 7 SPACE CONSTRUCTION
Man Days per Month
Headcount
5000.
4500.
4000.
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.0
150
125
100
75
50
25
0
13 224 434 642 849 1058 1268 1480 1687 1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ


PROJECT GBER CODE 8 SPACE TRANSPORTATION
Man Days per Month
Headcount
5000.
4500.
4000.
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.0
150
125
100
75
50
25
0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980..../...1981..../...1982..../...1983..../...1984..../...1985..../...1986..../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ

PROJECT GBER CODE 9 POWER DISTR & PROCESSING




PROJECT GBER CODE 10 SPACE ENVIRONMENT EFFECTS
Man Days per Month
Headcount
207
500.
450.
400.
350.
300.
250.
200.
150.
100.
50.
0.0
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
13
224
434
642
849
1058
1268
1480
1687
1896
/...1980.../...1981.../...1982.../...1983.../...1984.../...1985.../...1986.../..1987
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ

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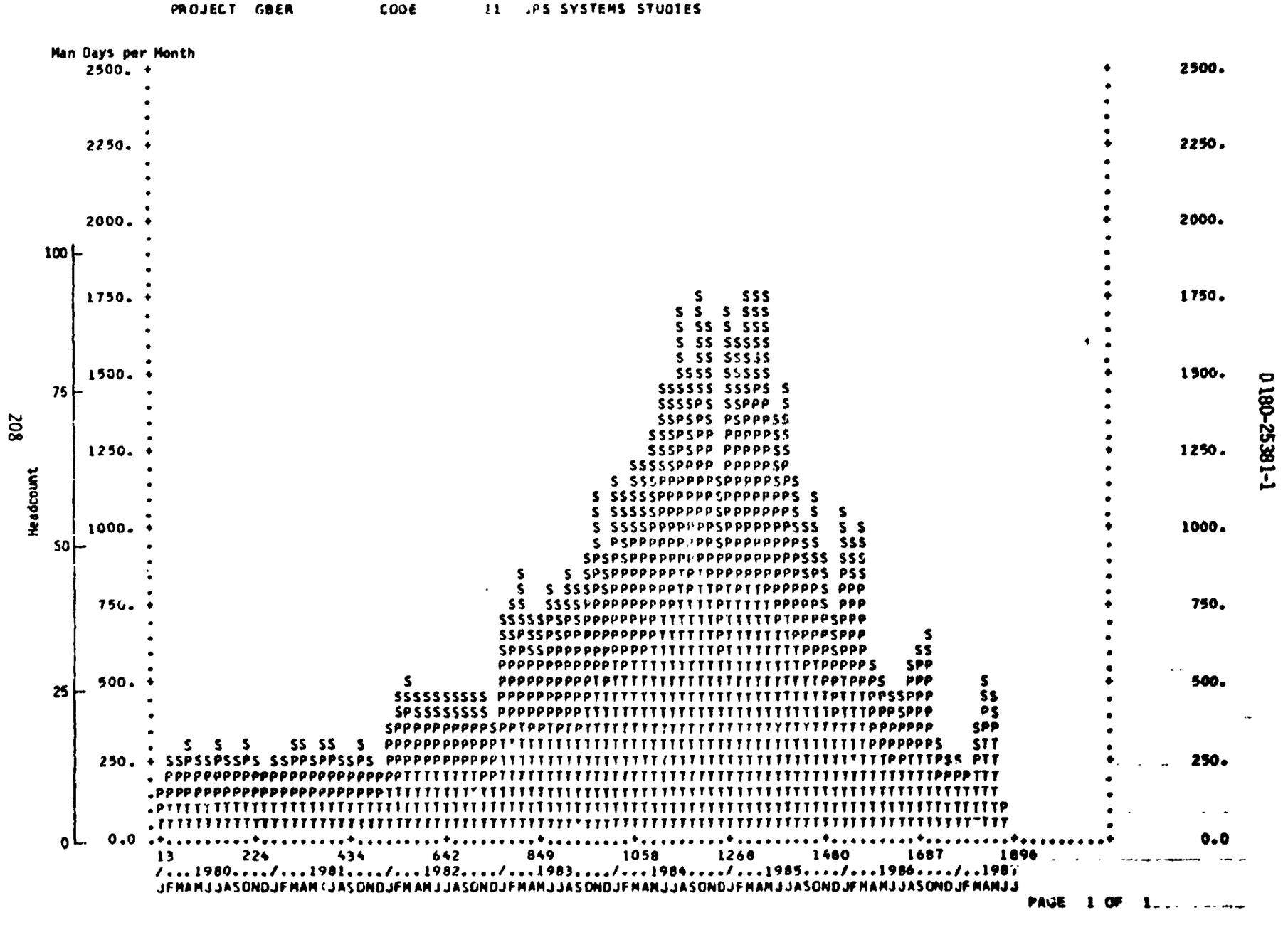
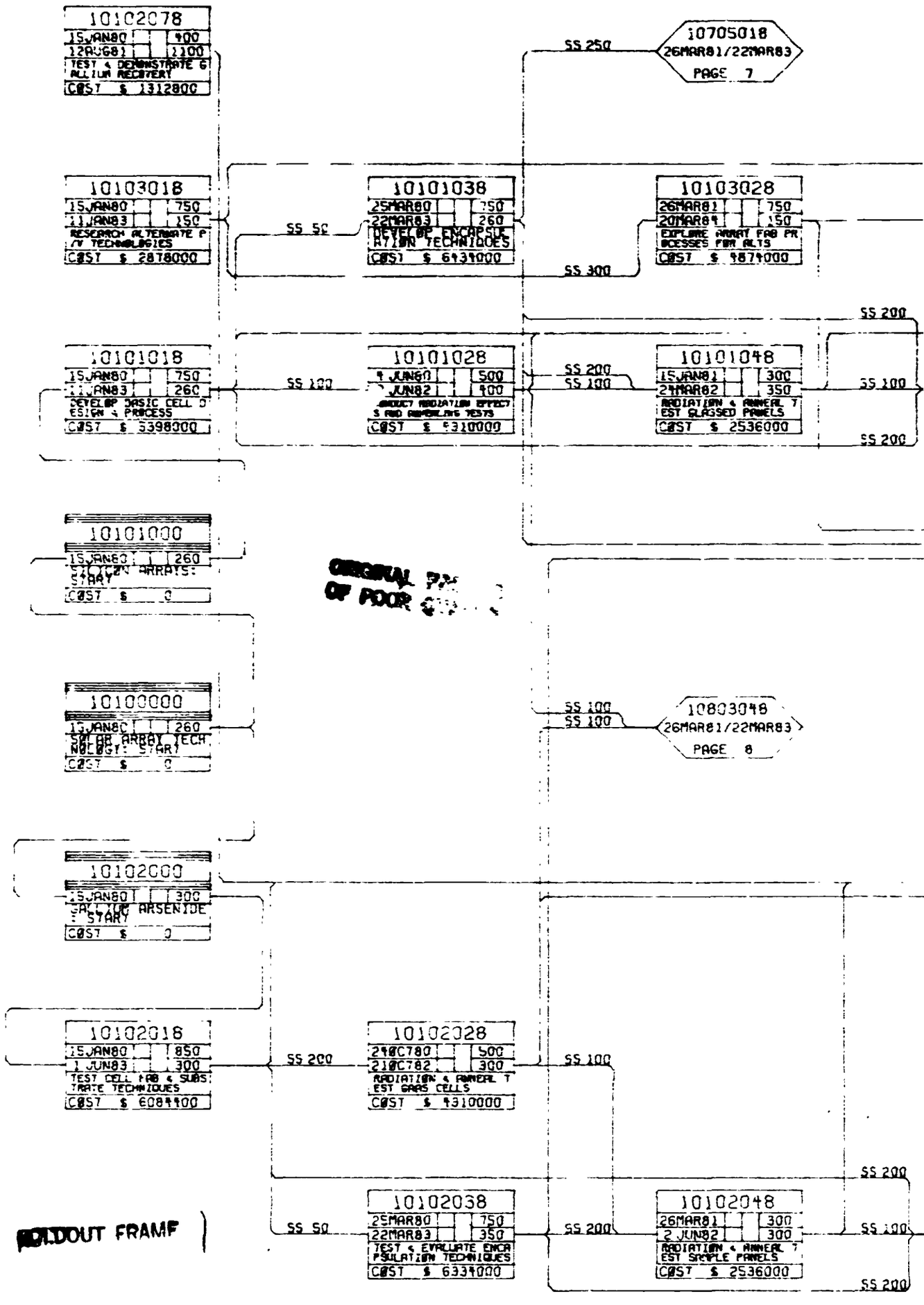
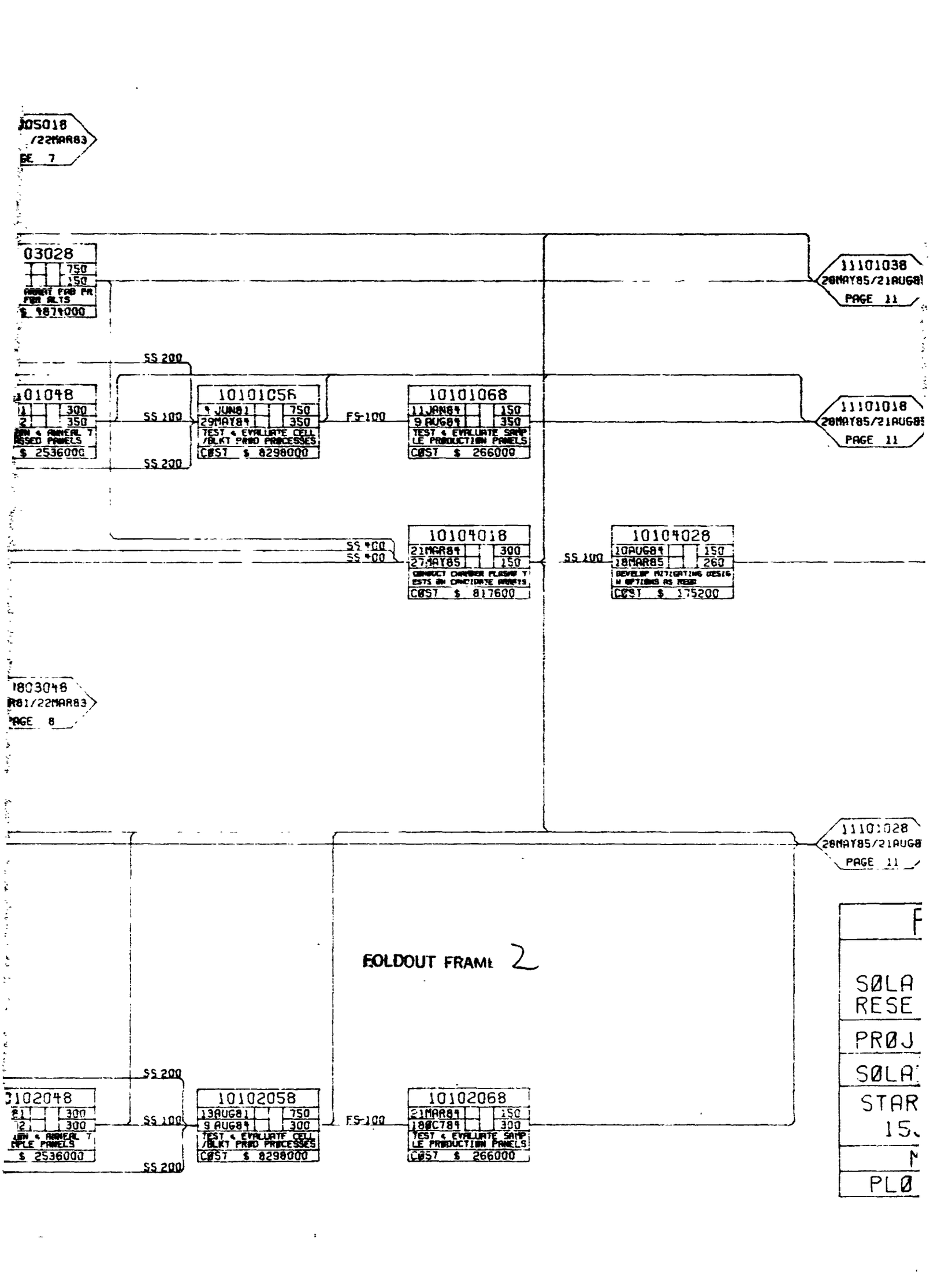
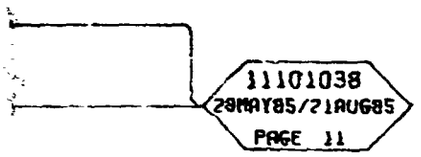
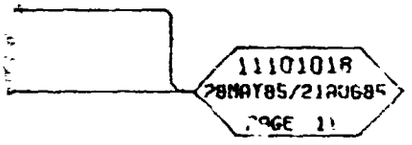
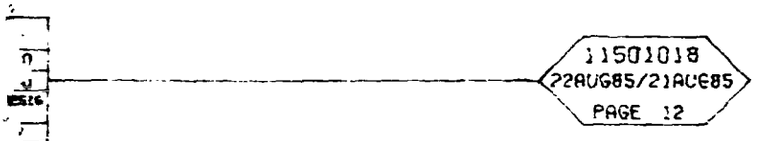

PROJECT GBER CODE 11 JPS SYSTEMS STUDIES
Man Days per Month
2500.
2250.
2000.
1750.
1500.
1250.
1000.
750.
500.
250.
0.0
100
75
50
25
0
Headcount
208
13
224
434
642
849
1058
1268
1480
1687
1896
1980
1981
1982
1983
1984
1985
1986
JFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJASONDJFMAMJJ
PAGE 1 OF 1
D180-25381-1


10102078
15JAN80 900
12AUG81 1100
TEST & DEMONSTRATE G
ALLIUM RECOVERY
COST $ 1312800
10705018
26MAR81/22MAR83
PAGE 7
SS 250
10103018
15JAN80 750
11JAN83 150
RESEARCH ALTERNATE P
V TECHNOLOGIES
COST $ 2878000
SS 50
10101038
25MAR80 750
22MAR83 260
DEVELOP ENCAPSUL
ATION TECHNIQUES
COST $ 6939000
SS 300
10103028
26MAR81 750
20MAR84 150
EXPLORE ARRAY FAB PR
OCESSES FOR ALTS
COST $ 9879000
SS 200
10101018
15JAN80 750
11JAN83 260
DEVELOP BASIC CELL D
ESIGN & PROCESS
COST $ 5398000
SS 100
10101028
1 JUN80 500
1 JUN82 900
RADIATION EFFECT
S AND ANNEALING TESTS
COST $ 9310000
SS 200
SS 100
10101048
15JAN81 300
21MAR82 350
RADIATION & ANNEAL T
EST GLASSED PANELS
COST $ 2536000
SS 100
SS 200
10101000
15JAN80 260
START ARRAYS
START
COST $ 0
10100000
15JAN80 260
SOLAR ARRAY TECH
NOLOGY START
COST $ 0
SS 100
SS 100
10803048
26MAR81/22MAR83
PAGE 8
10102000
15JAN80 300
GALLIUM ARSENIDE
START
COST $ 0
10102018
15JAN80 850
1 JUN83 300
TEST CELL FAB & SUBS
TRATE TECHNIQUES
COST $ 6089100
SS 200
10102028
29DEC80 500
21DEC82 300
RADIATION & ANNEAL T
EST GAAS CELLS
COST $ 9310000
SS 100
SS 200
10102038
25MAR80 750
22MAR83 350
TEST & EVALUATE ENCA
PSULATION TECHNIQUES
COST $ 6339000
SS 50
SS 200
10102048
26MAR81 300
2 JUN82 300
RADIATION & ANNEAL T
EST SAMPLE PANELS
COST $ 2536000
SS 100
SS 200
FOLDOUT FRAME


105018
/22MAR83
GE 7
03028
750
150
ARRAY PROD PR
FOR ALTS
$ 9879000
11101038
20MAY85/21AUG8
PAGE 11
SS 200
101048
1 300
2 350
ION & MINERAL T
ASSED PANELS
$ 2536000
SS 100
10101058
9 JUN81 750
29MAY84 350
TEST & EVALUATE CELL
/BLKT PROD PROCESSES
COST $ 8290000
FS-100
10101068
11JAN84 150
9 AUG84 350
TEST & EVALUATE SAMP
LE PRODUCTION PANELS
COST $ 266000
11101018
20MAY85/21AUG8
PAGE 11
SS 200
SS 100
10104018
21MAR84 300
27MAY85 150
CONDUCT CHAMBER PLASMA T
ESTS ON CANDIDATE ARRAYS
COST $ 817600
10104028
10AUG84 150
18MAR85 260
DEVELOP MITIGATING DESIG
N OPTIONS AS NEED
COST $ 175200
1803048
R81/22MAR83
AGE 8
11101028
20MAY85/21AUG8
PAGE 11
FOLDOUT FRAME 2
SS 200
2102048
1 300
2 300
ION & MINERAL T
PLE PANELS
$ 2536000
SS 100
10102058
13AUG81 750
9 AUG84 300
TEST & EVALUATE CELL
/BLKT PROD PROCESSES
COST $ 8290000
FS-100
10102068
21MAR84 150
18OCT84 300
TEST & EVALUATE SAMP
LE PRODUCTION PANELS
COST $ 266000
SS 200
F
SOLA
RESE
PROJ
SOLA
STAR
15.
N
PLO

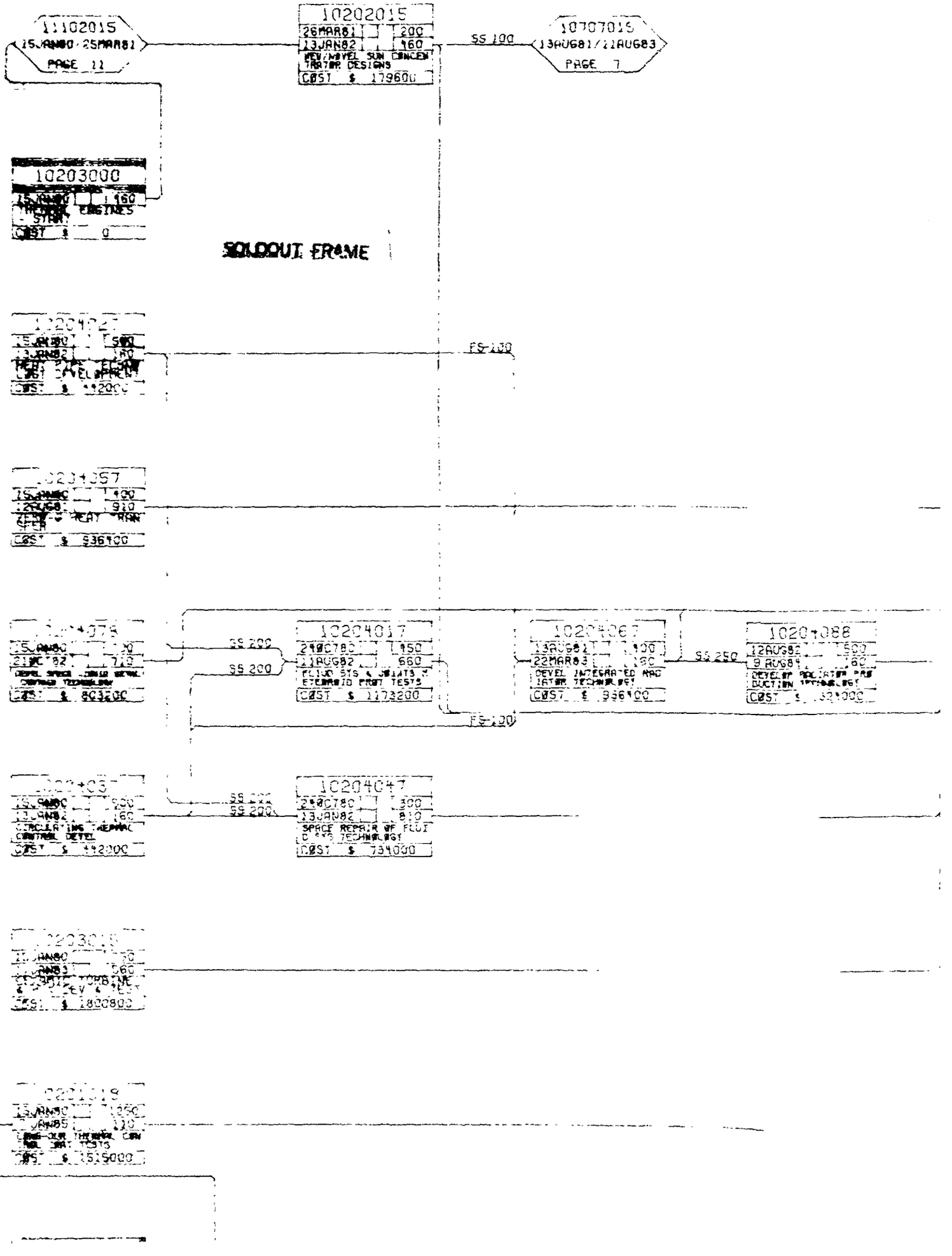


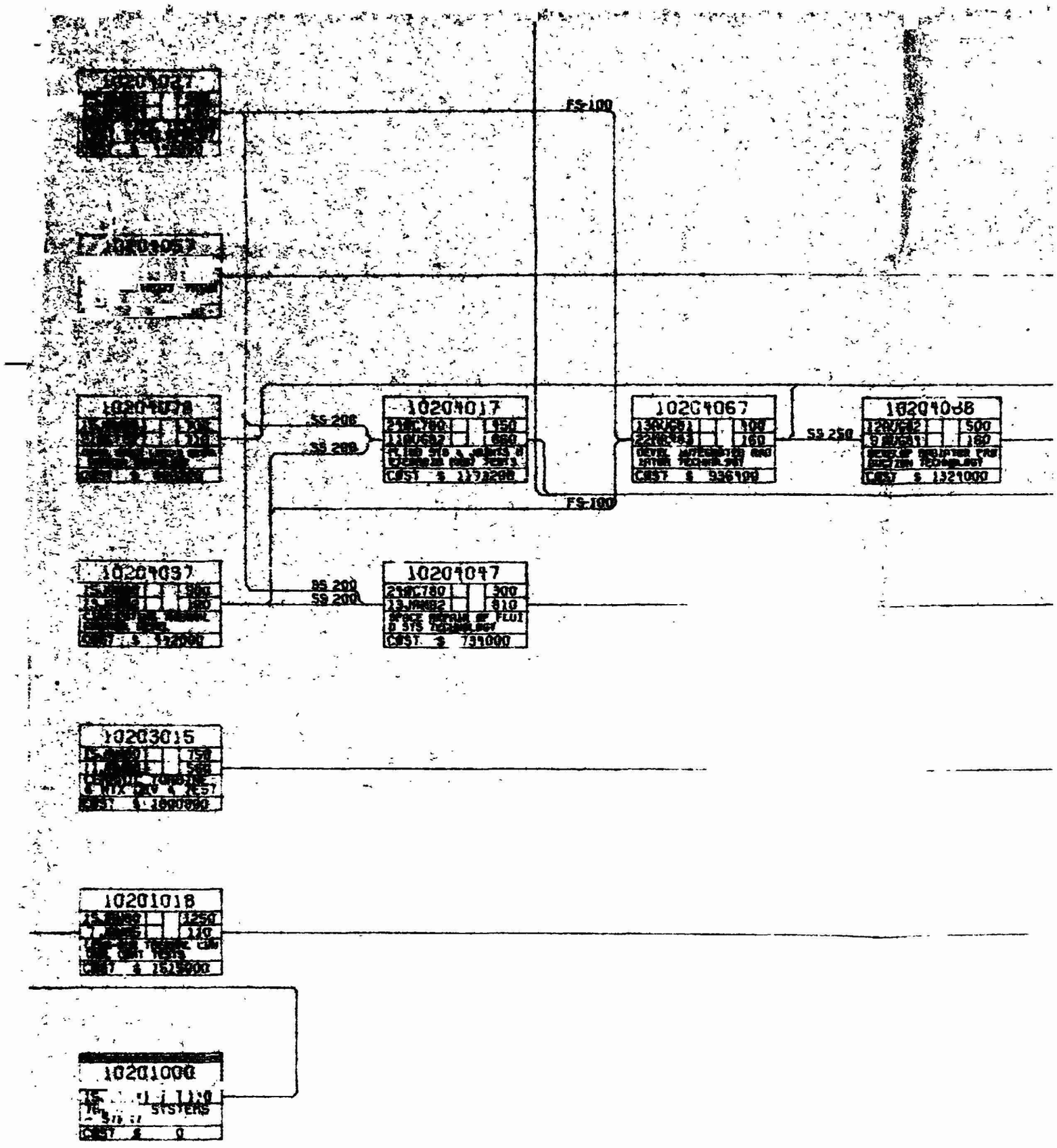




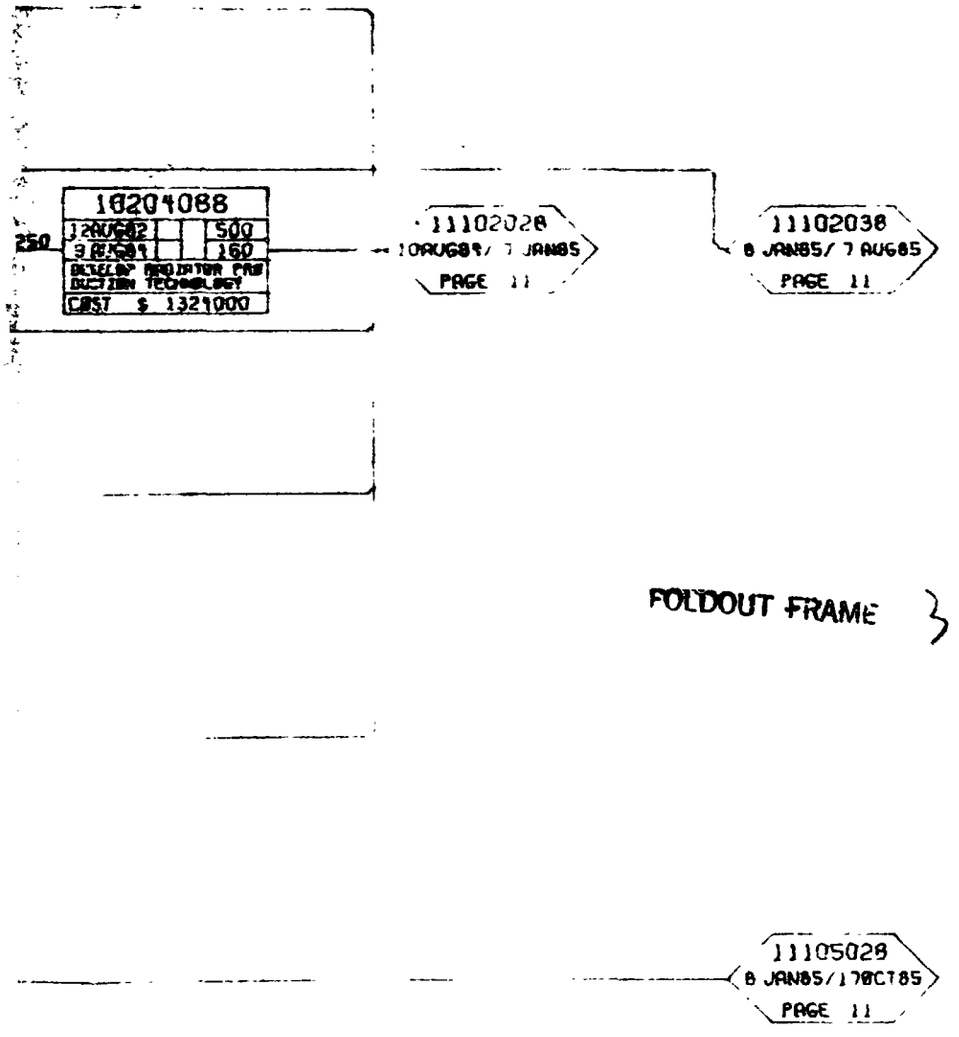
FOLDOUT FRAME 3

PRØJECT/2 - V77B2		
SØLAR PØWER SATELLITE RESEARCH, DEVELØPMENT, & EVALUATIØN		
PRØJECT GBER	EJECT CØDE = 1	
SØLAR ARRAYS		
START DATE 15JAN80		CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979	
PLØT *GBER *	PAGE 1 SHEET 1 / 1	


11102015
15JAN80 25MAR81
PAGE 11
10202015
26MAR81 200
13JAN82 160
REV/MVEL SUN CONCEN
COST $ 179600
SS 100
10707015
13AUG81/21AUG83
PAGE 7
10203000
160
COST $ 0
SOLDOUT FRAME
FS 100
SS 200
10204017
29OCT80 150
11AUG82 660
COST $ 1173200
SS 200
FS 100
10204067
13AUG82 100
22MAR83 180
DEVEL INTEGRATED MAG
COST $ 936100
SS 250
10204088
12AUG82 500
9 AUG83 60
COST $ 324000
SS 200
10204047
29OCT80 300
13JAN82 810
SPACE REPAIR OF FLUI
COST $ 734000



FOLDOUT FRAME 2



FOLDOUT FRAME 3

PRØJECT/2 -

SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT,

PRØJECT GBER	EJE
THERMAL ENGINES & SYST	
START DATE 15JAN80	
MØDE Ø/FE	RU
PLØT 'GBER '	PAG

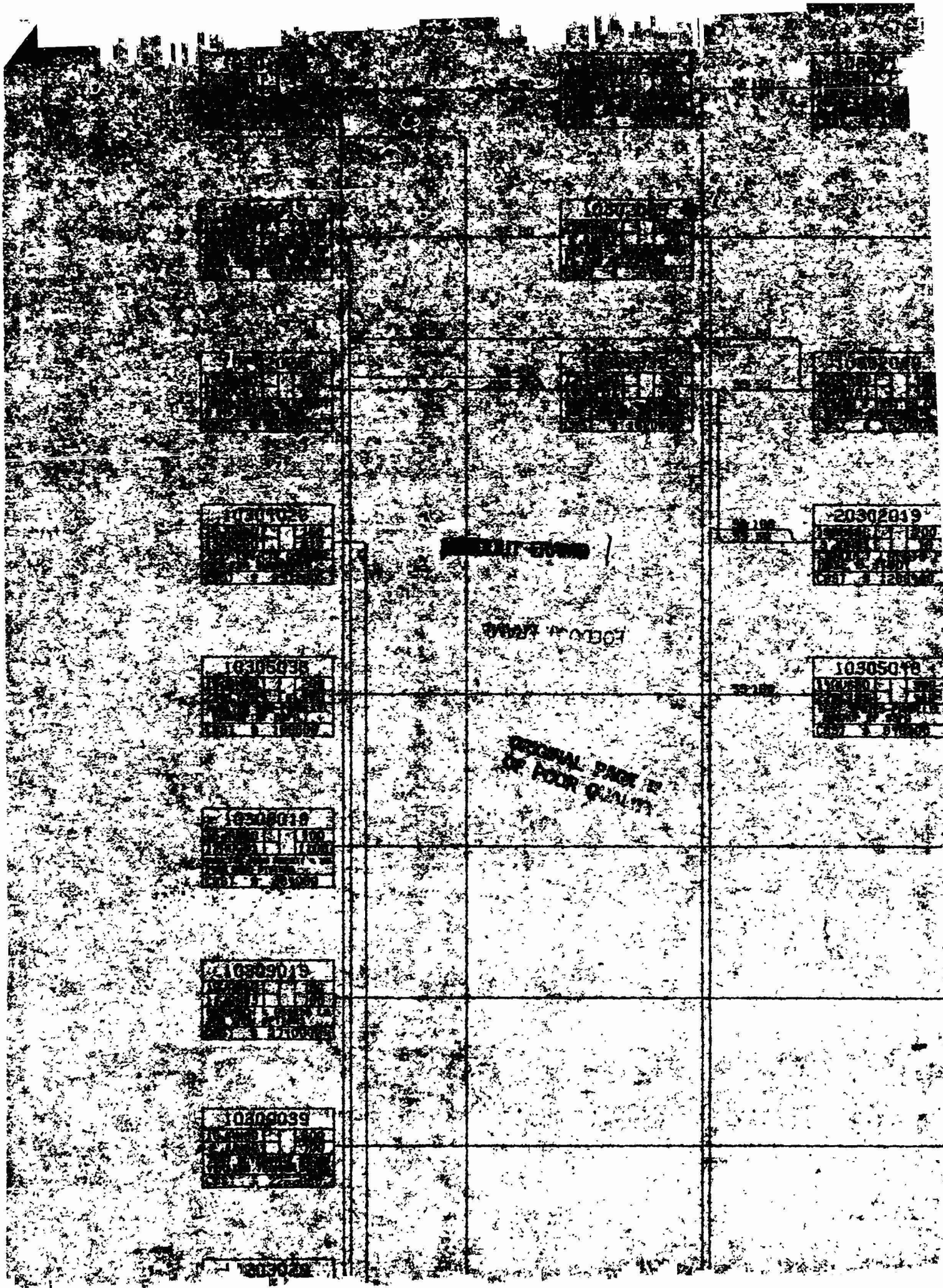
T FRAME

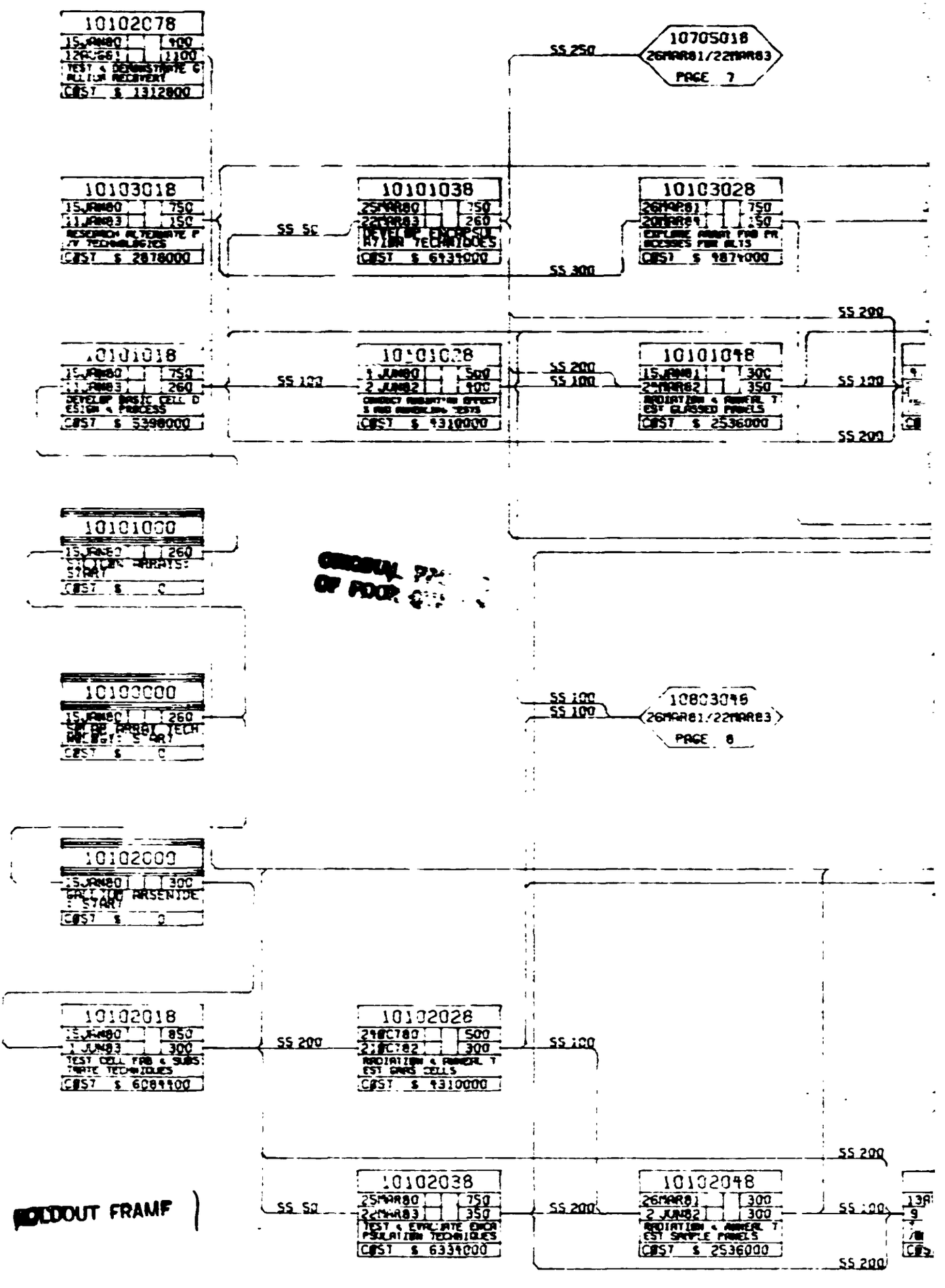
FOLDOUT FRAME 4

PRØJECT/2 - V77B2

SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT, & EVALUATIØN

PRØJECT GBER	EJECT CØDE = 2
THERMAL ENGINES & SYSTEMS	
START DATE 15JAN80	CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979
PLØT 'GBER '	PAGE 2 SHEET 1 / 1




10102078
10705018
26MAR81/22MAR83
PAGE 7
10103018
10101038
10103028
10101018
10101028
10101048
10101000
10103000
10803048
26MAR81/22MAR83
PAGE 8
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10102018
10102028
10102038
10102048
SS 250
SS 50
SS 300
SS 200
SS 100
SS 50
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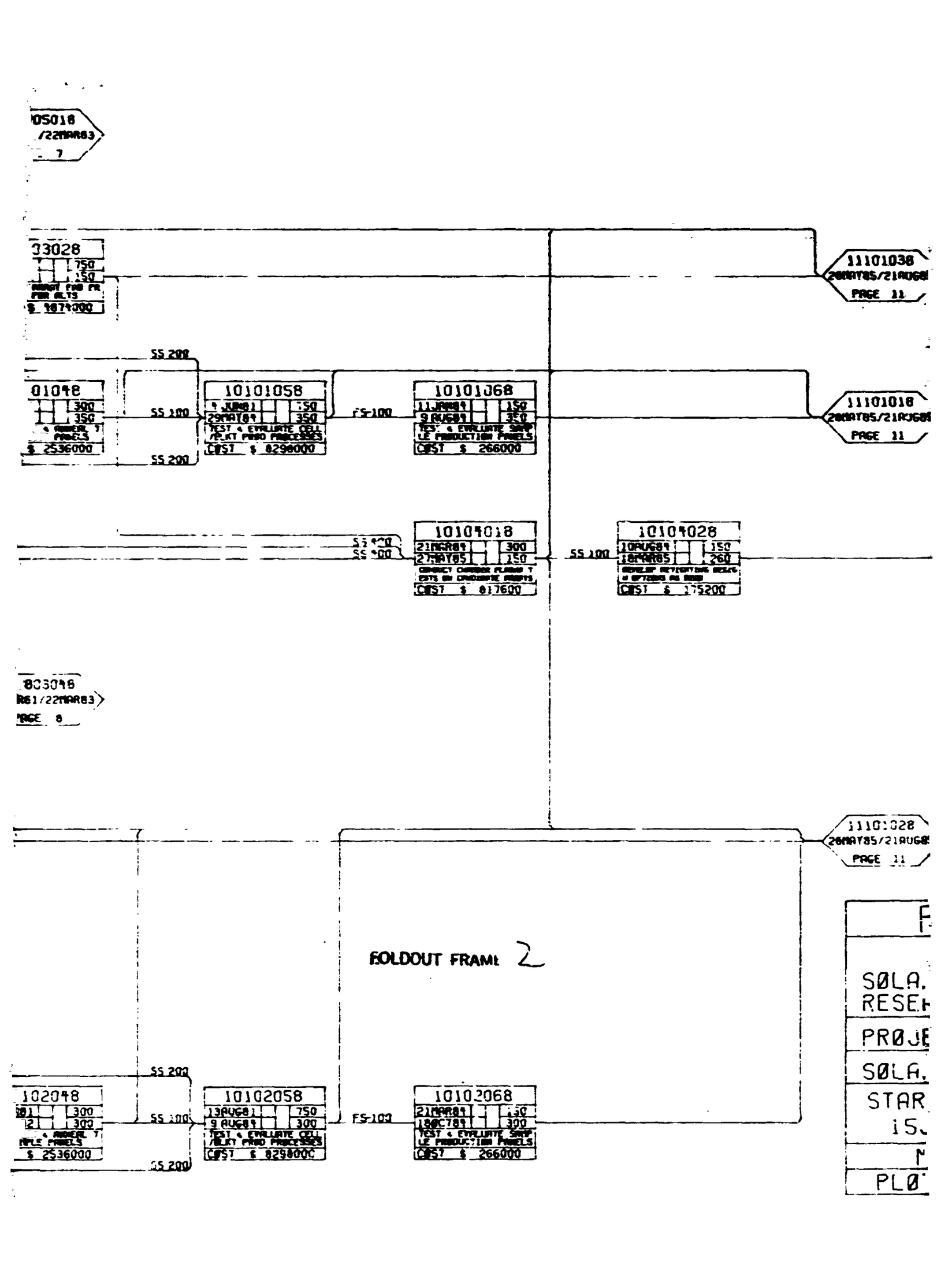
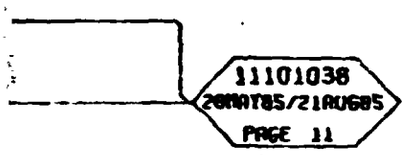
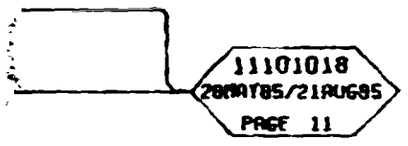

05018
/22MAR83
7
33028
750
150
$ 1874000
11101038
26MAY85/21AUG8
PAGE 11
SS 200
01048
300
350
$ 2536000
SS 100
SS 200
10101058
9 JUN89
29MAY89
750
350
TEST & EVALUATE CELL
/PLKT PROD PROCESSES
COST $ 0296000
FS-100
10101068
11JUN89
9 AUG89
150
350
TEST & EVALUATE SHIP
LE PRODUCTION PANELS
COST $ 266000
11101018
26MAY85/21AUG8
PAGE 11
10104018
21MAR89
27MAY85
300
150
COST $ 017600
SS 100
10104028
10AUG89
18MAR85
150
260
COST $ 175200
803048
R61/22MAR83
PAGE 8
FOLDOUT FRAME 2
11101028
26MAY85/21AUG8
PAGE 11
102048
300
300
$ 2536000
SS 200
SS 100
SS 200
10102058
13AUG8
9 AUG89
750
300
TEST & EVALUATE CELL
/BLKT PROD PROCESSES
COST $ 0258000
FS-102
10102068
21MAR89
18OCT89
300
300
TEST & EVALUATE SHIP
LE PRODUCTION PANELS
COST $ 266000
SØLA.
RESE
PRØJE
SØLA.
STAR
15.
PLØ





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SØLAR PØWER SATELLITE RESEARCH, DEVELØPMENT, & EVALUATIØN		
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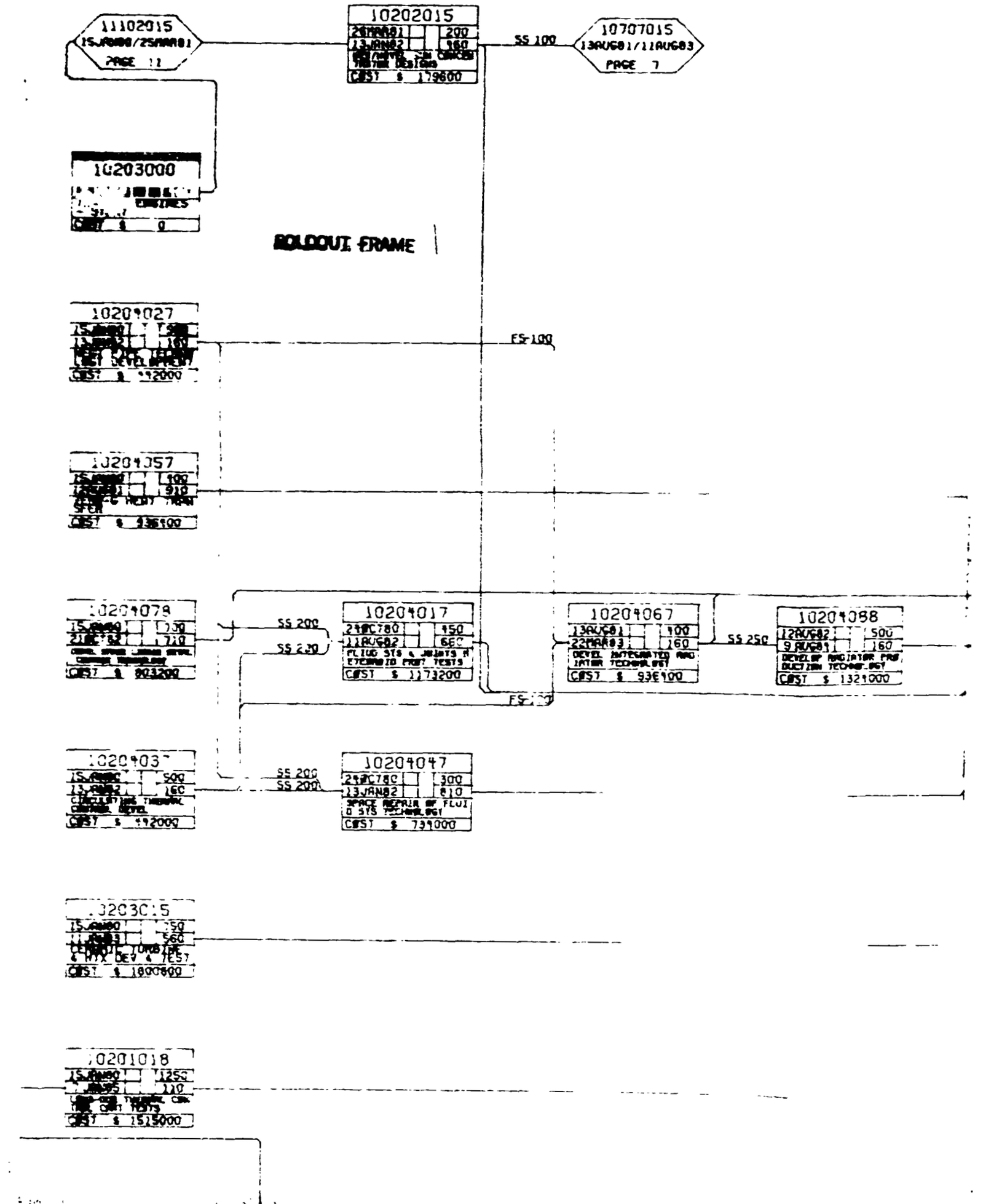
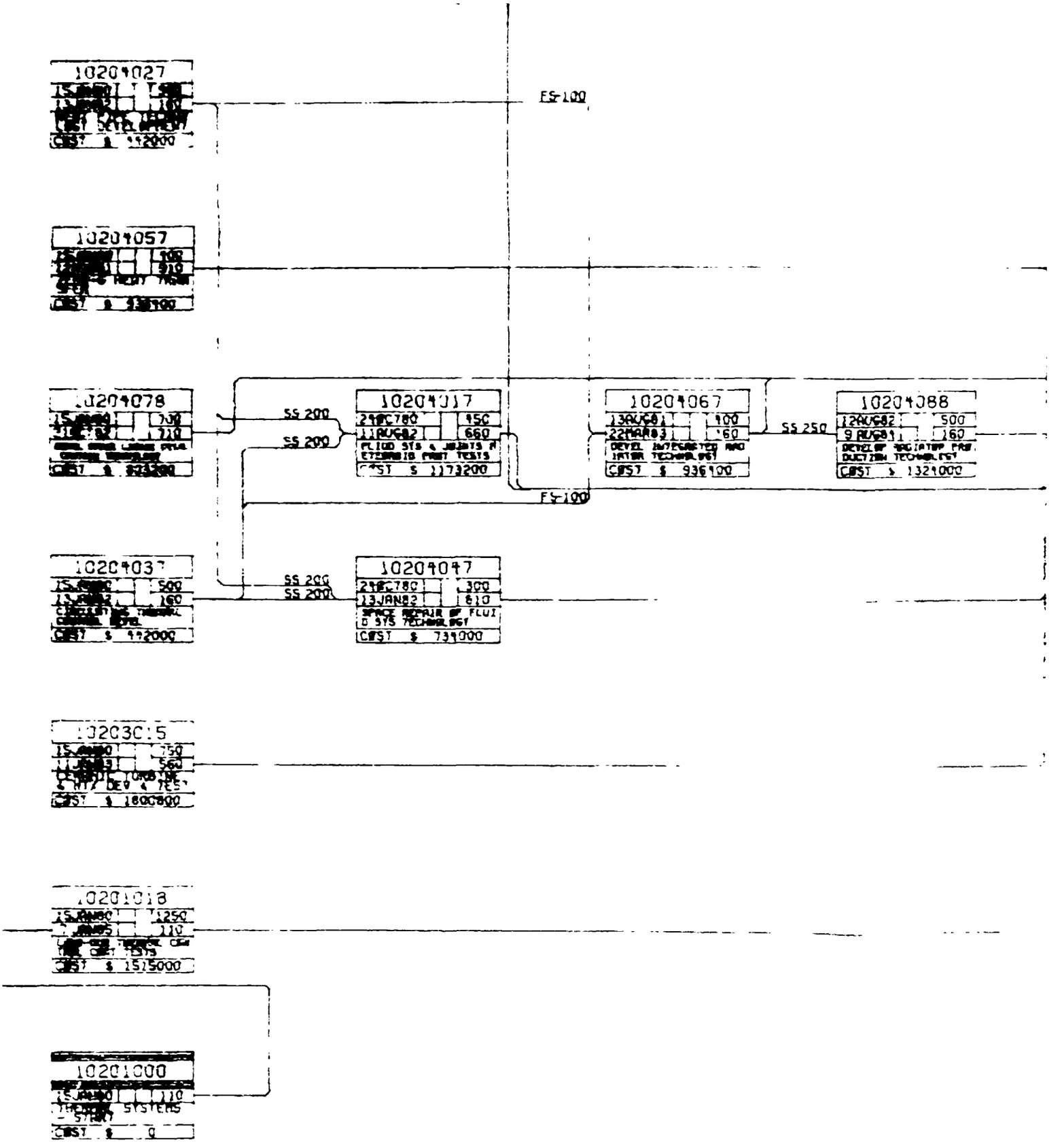
SØLAR ARRAYS		
START DATE 15JAN80		CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979	
PLØT 'GBER '	PAGE 1 SHEET 1 / 1	


11102015
PAGE 11
10202015
200
160
COST $ 179600
SS 100
10707015
13AUG01/11AUG03
PAGE 7
10203000
COST $ 0
BOLDOUT FRAME
10209027
COST $ 992000
FS 100
10209057
100
910
COST $ 936900
10209078
030
710
COST $ 903200
SS 200
SS 200
10209017
29DEC00
11AUG02
950
660
FLIGHT SYS & MGMTS H
EXTENDED PERF TESTS
COST $ 1173200
10209067
13AUG01
22MAR03
100
160
COST $ 936900
SS 250
10209088
12AUG02
9 AUG01
500
160
COST $ 1329000
10209037
500
160
COST $ 992000
SS 200
SS 200
10209047
29DEC00
13JAN02
300
810
COST $ 739000
10203015
050
560
COST $ 1800800
10201018
1255
110
COST $ 1515000



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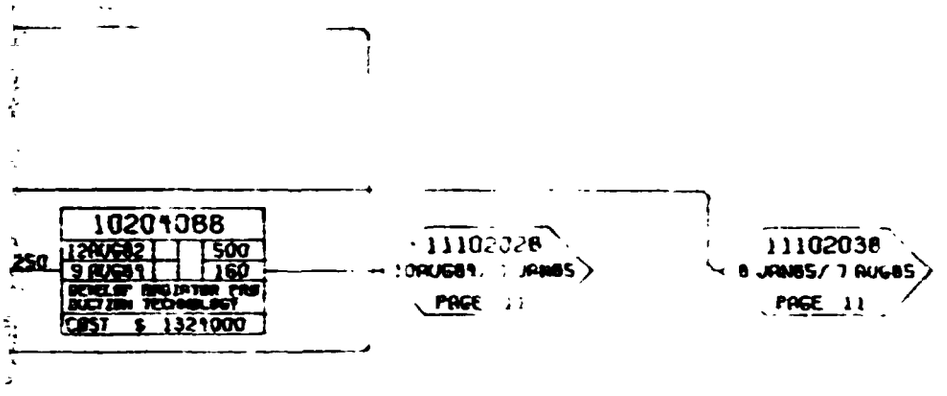


FOLDOUT FRAME 3

PRØJECT/2 -	
SØLAR PØWER SATELLITE RESEARCH, DEVELØPMENT,	
PRØJECT GBER	EJE
THERMAL ENGINES & SYST	
START DATE 15JAN80	
MØDE Ø/FE	RU
PLØT 'GBER '	PAG

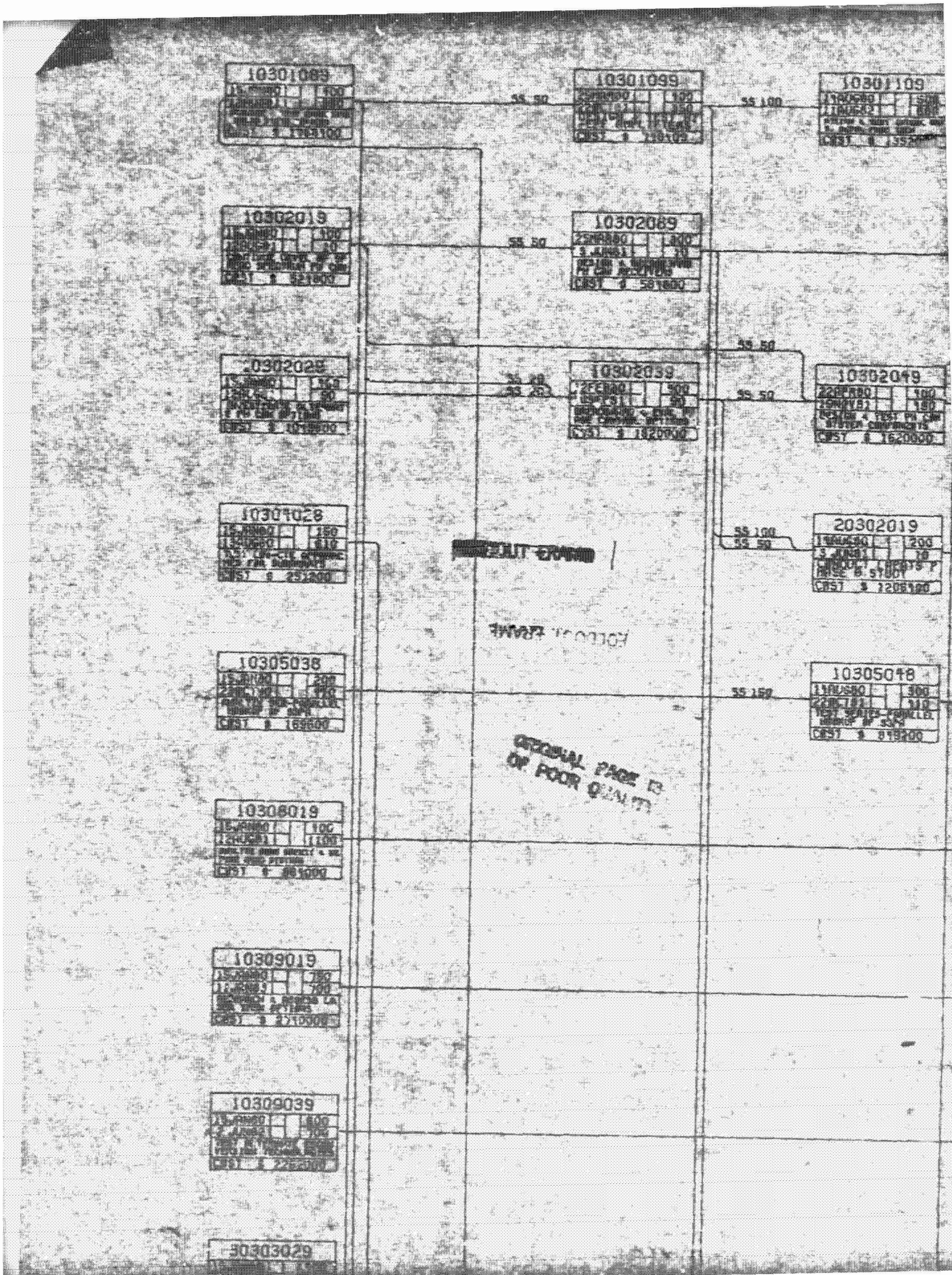
11102038
8 JAN85/ 7 AUG85
PAGE 11

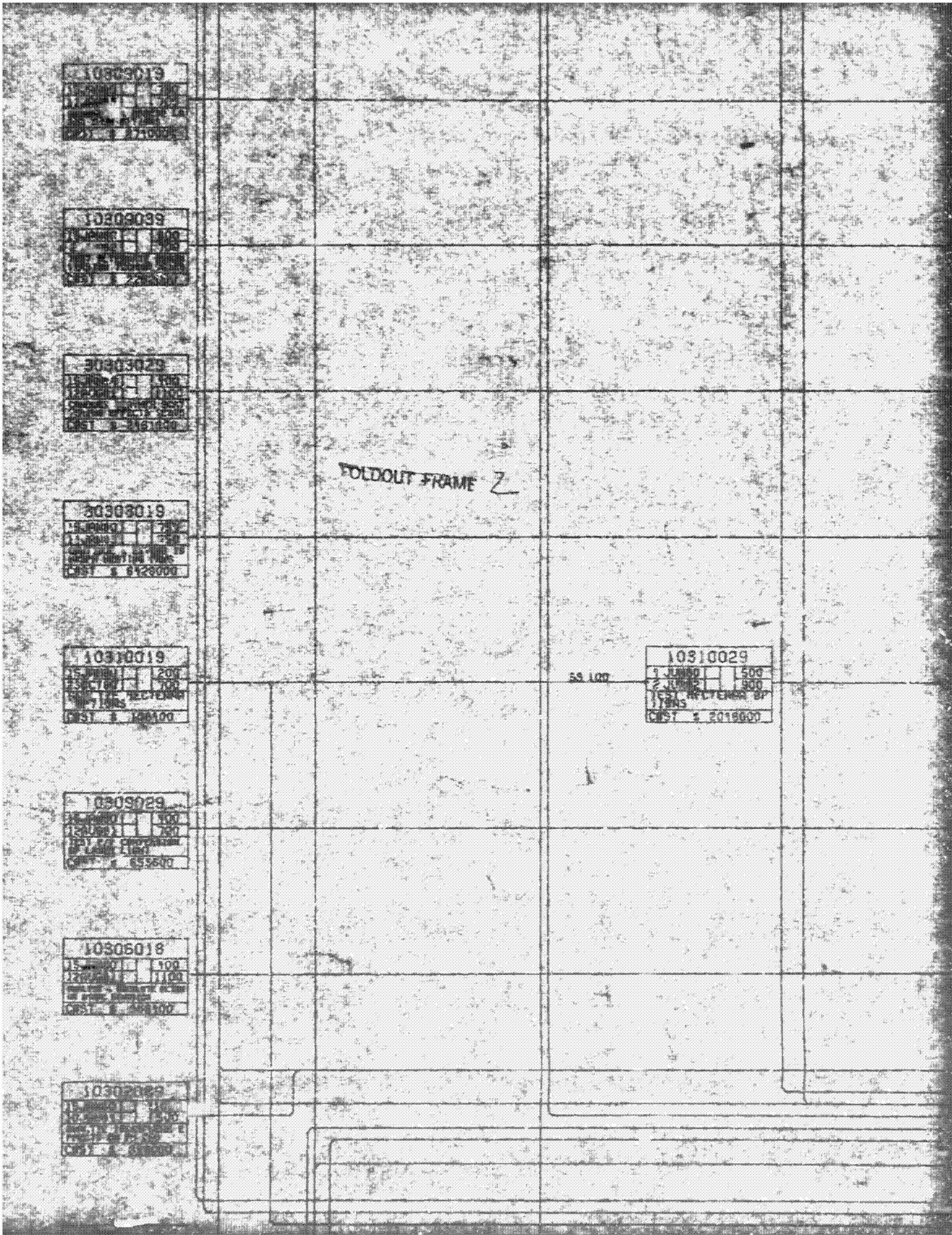
JT FRAME

FOLDOUT FRAME 4

PRØJECT/2 - V77B2		
SØLAR PØWER SATELLITE RESEARCH, DEVELØPMENT, & EVALUATIØN		
PRØJECT GBER		EJECT CØDE = 2
THERMAL ENGINES & SYSTEMS		
START DATE 15JAN80		CØMPLETIØN 1 APR86
MØDE Ø/FE		RUN MAY 25, 1979
PLØT 'GBER '		PAGE 2 SHEET 1 / 1

11105028
8 JAN85/ 17 OCT85
PAGE 11


10301089
10301099
10301109
10302019
10302089
10302025
10302059
10302049
10305028
20302019
10305036
10305048
10306019
10309019
10309039
30303029
55 50
55 100
55 150
ORIGINAL PAGE IS
OF POOR QUALITY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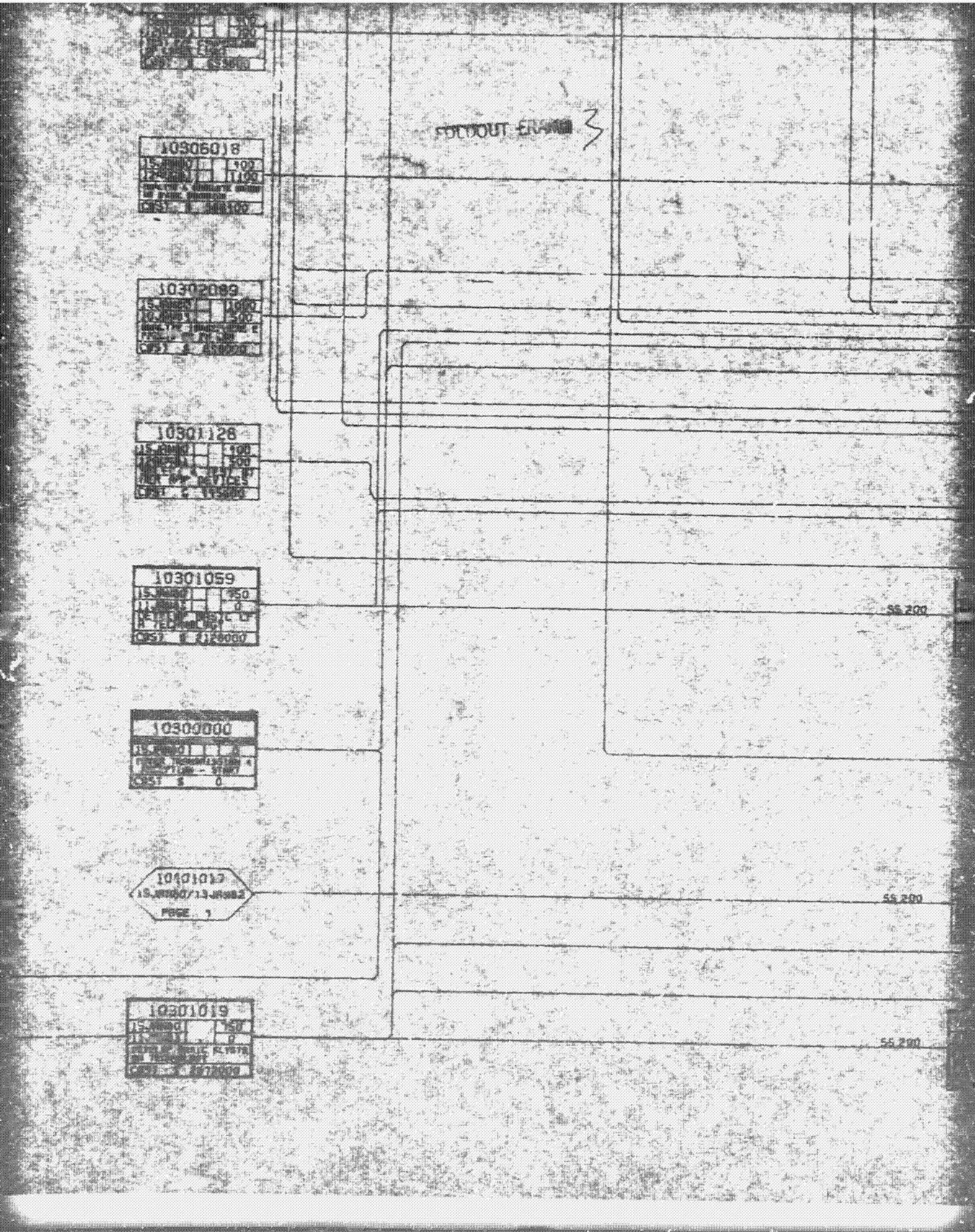
10310029
10309029
10306018
10302029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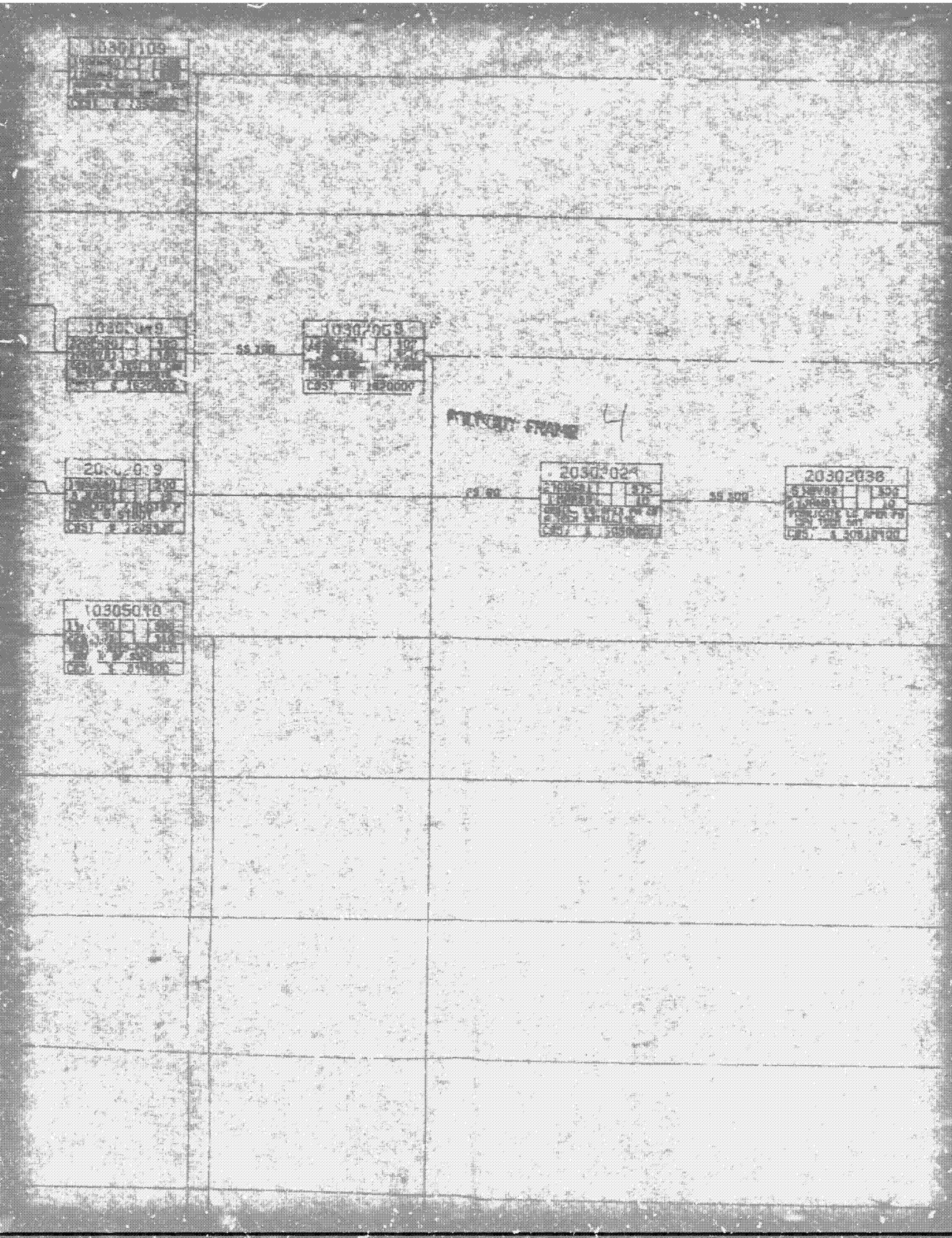
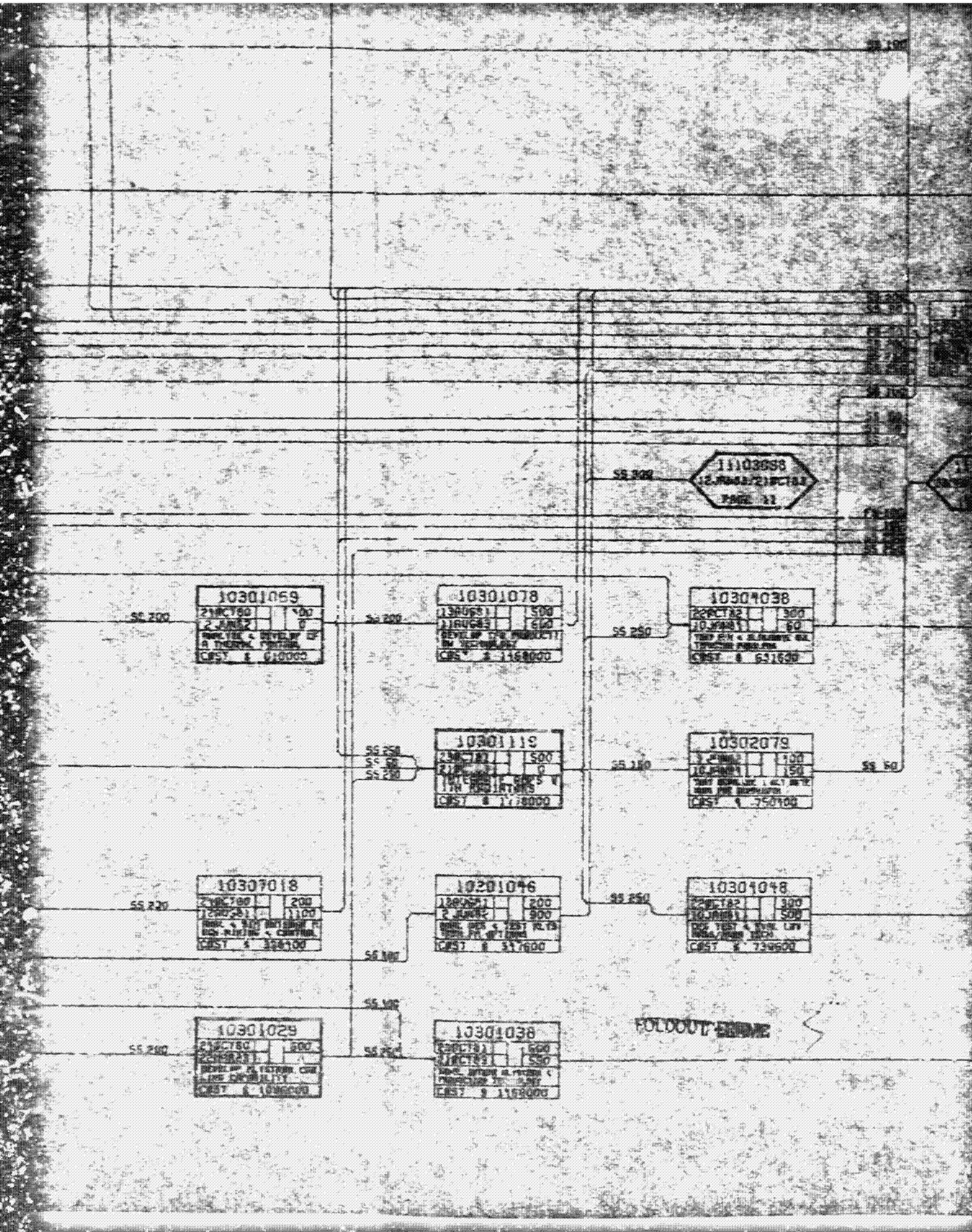
10301128
10301059
10300000
10301019
SS 200
SS 200
SS 200

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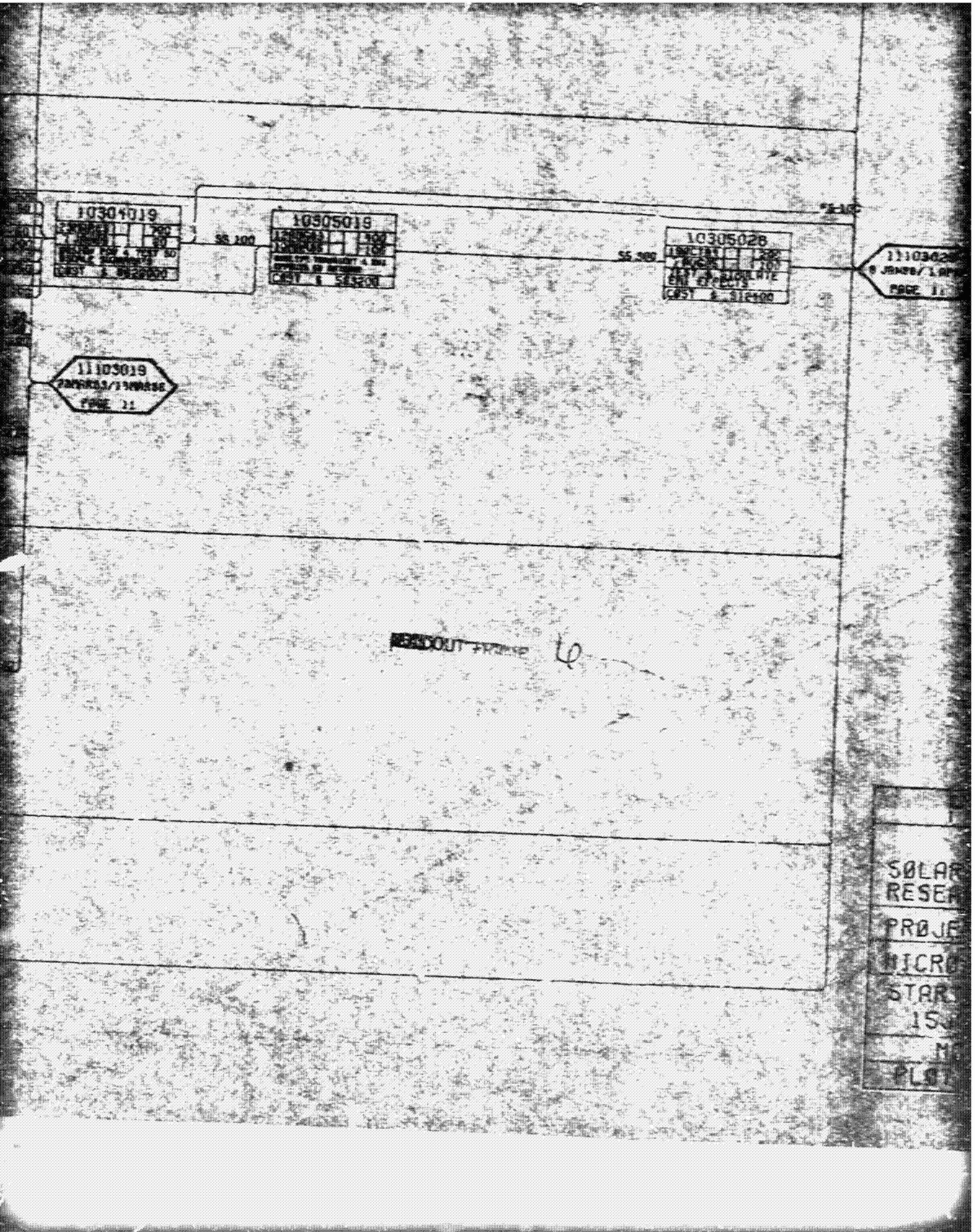
FOLDOUT FRAME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10305019
10305028
SS 300
SS 300
SS 300
11103019
PAGE 11
11103028
PAGE 11
SOLAR
RESEA
PROJE
MICRO
STAR
15
PLOT

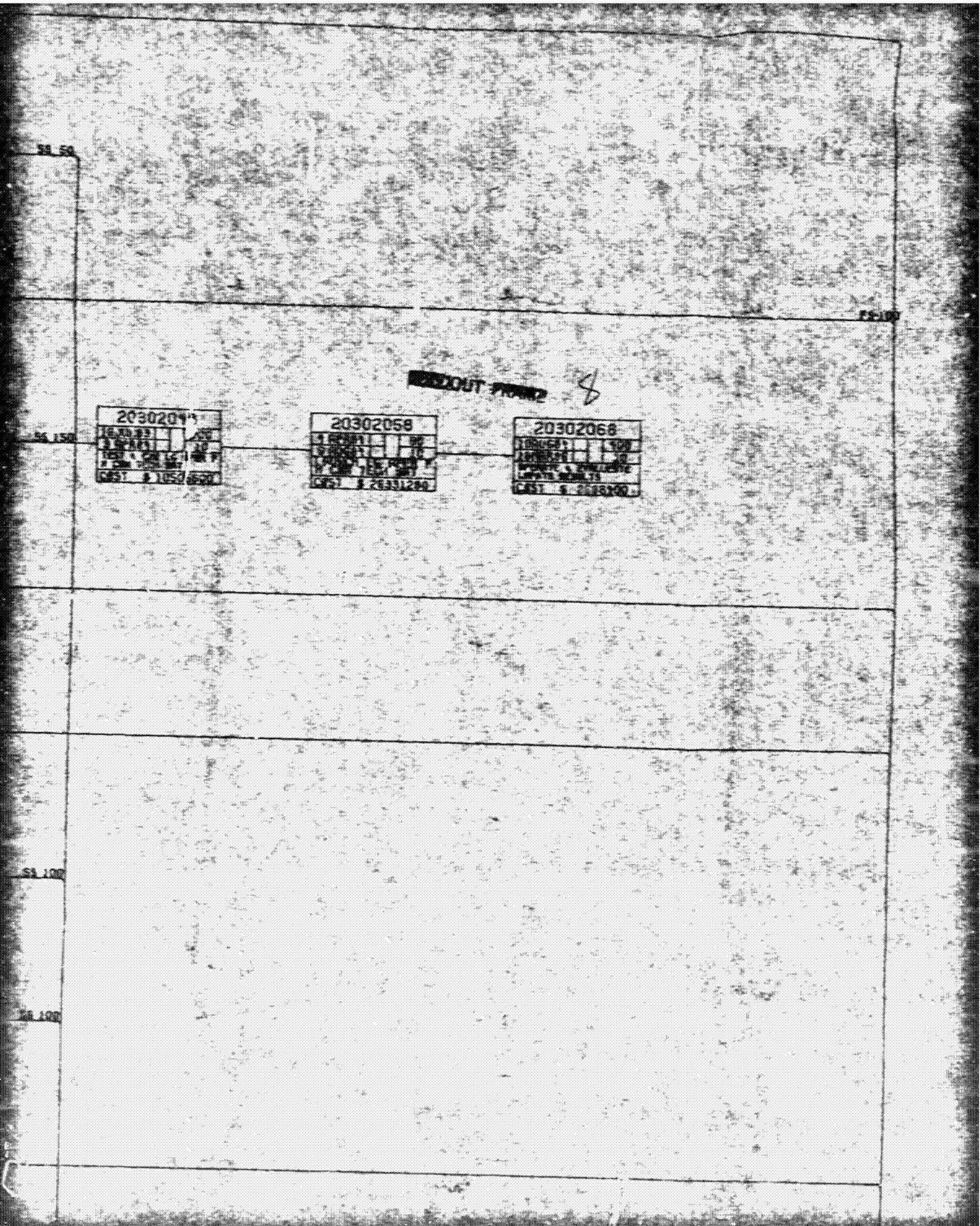
11103025
5 JAN80/ L0PR56
PAGE 11

ROLLOUT FRAME 7

PROJECT/2 - V7782

SOLAR POWER SATELLITE
RESEARCH, DEVELOPMENT, & EVALUATION

PROJECT GBER	EJECT CODE = 3
MICROWAVE POWER TRANSMISSION	
START DATE 1SJAN80	COMPLETION 1APR83
MODE 0/FE	RUN MAY 25, 1979
PLOT GBER	PAGE 3 SHEET 1 /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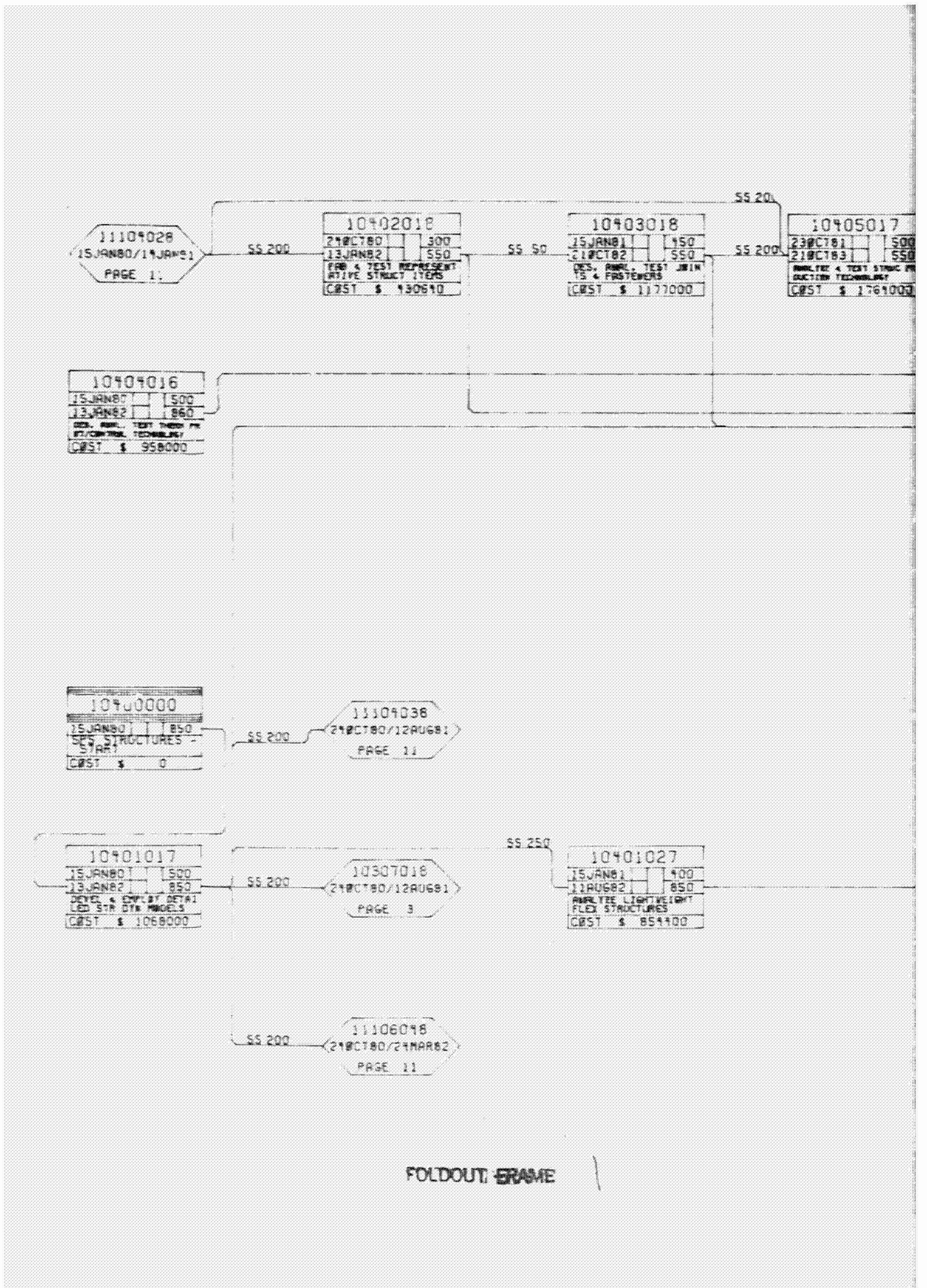
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15JAN80/19JAN81
PAGE 1.
SS 200
10402018
21@C780 300
13JAN82 550
C@ST $ 930690
SS 50
10403018
15JAN81 150
21@CT82 550
C@ST $ 1177000
SS 200
10405017
23@C781 500
21@C783 550
C@ST $ 1761000
10409016
15JAN87 500
13JAN82 860
C@ST $ 958000
10400000
15JAN80 850
SPS STRUCTURES - START
C@ST $ 0
SS 200
11109038
21@C780/12AUG81
PAGE 11
10401017
15JAN80 500
13JAN82 850
C@ST $ 1068000
SS 200
10307018
21@C780/12AUG81
PAGE 3
SS 250
10401027
15JAN81 900
11AUG82 850
C@ST $ 859400
SS 200
11106098
21@C780/24MAR82
PAGE 11
FOLDOUT FRAME

10905017
@CT81 | 500
@CT83 | 550
ALTER & TEST 17B0C PRO
SYSTEM TECHNOLOGY
DT $ 1761000

11109018
21@CT83/2*JAN81
PAGE 11

11105028
5 JAN85/17@CT85
PAGE 11

FOLDOUT FRAME

PROJECT/2 - V77B2

SOLAR POWER SATELLITE
RESEARCH, DEVELOPMENT, & EVALUATION

PROJECT GBER | EJECT CODE = 4

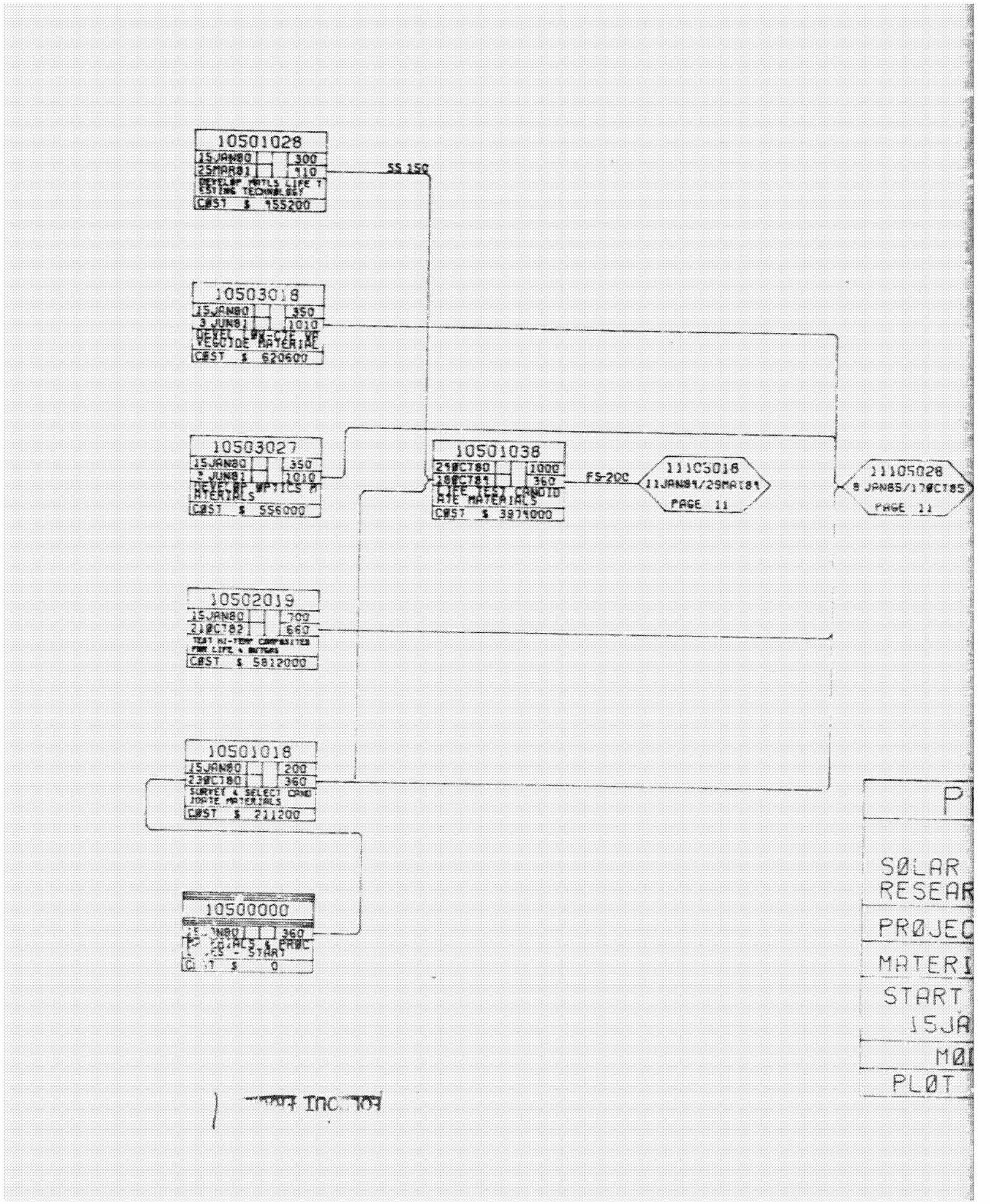
STRUCTURES & DYNAMICS

START DATE
15JAN80

COMPLETION
1 APR86

MODE 0/FE | RUN MAY 25, 1979

PLOT 'GBER ' | PAGE 4 SHEET 1 / 1


10501028
15JAN80 300
25MAR81 910
DEVELOP MTLS LIFE T ESTING TECHNOLOGY
COST $ 155200
SS 150
10503018
15JAN80 350
3 JUN81 1010
DEVEL [illegible] VP VEGOIDE MATERIAL
COST $ 620600
10503027
15JAN80 350
3 JUN81 1010
DEVELOP MPTLS M ATERIALS
COST $ 556000
10501038
21OCT80 1000
18OCT84 360
LIFE TEST CANDID ATE MATERIALS
COST $ 3979000
FS-200
11105018
11JAN81/29MAR84
PAGE 11
11105028
8 JAN85/17OCT85
PAGE 11
10502019
15JAN80 700
21OCT82 660
TEST MU-TEMP COMPOSITES FOR LIFE & BATTERS
COST $ 5812000
10501018
15JAN80 200
23OCT80 360
SURVEY & SELECT CAND IDATE MATERIALS
COST $ 211200
10500000
15JAN80 360
PROJECT START
COST $ 0
SOLAR
RESEAR
PROJEC
MATERI
START
15JA
MOD
PLOT

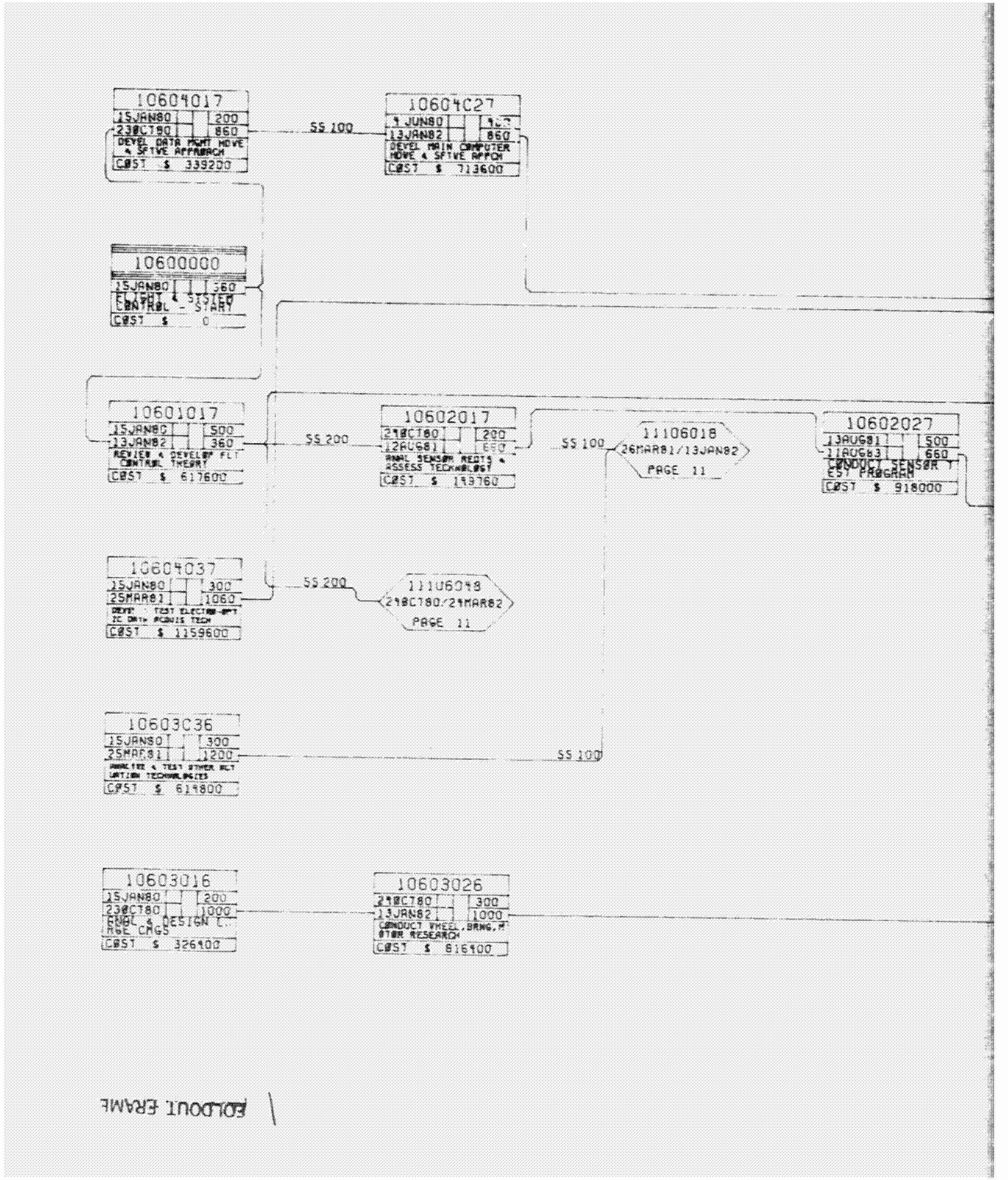
11105018
11JAN84/29MAI84
PAGE 11

11105028
8 JAN85/17ØCT85
PAGE 11

PRØJECT/2 - V77B2

SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT, & EVALUATIØN

PRØJECT GBER	EJECT CØDE = 5
MATERIALS	
START DATE 15JAN80	CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979
PLØT 'GBER '	PAGE 5 SHEET 1 / 1


10604017
15JAN80 200
23DEC790 860
DEVEL DATA MGMT MDVE & SFTVE APPROACH
COST $ 339200
SS 100
10604C27
1 JUN80 [illegible]
13JAN82 860
DEVEL MAIN COMPUTER MDVE & SFTVE APPCH
COST $ 713600
10600000
15JAN80 360
FLIGHT & SYSTEM CONTROL - START
COST $ 0
10601017
15JAN80 500
13JAN82 360
REVIEW & DEVELOP FLT CONTROL THEORY
COST $ 617600
SS 200
10602017
29DEC780 200
12AUG811 660
PANEL SENSOR MGMTS & ASSESS TECHNOLOGY
COST $ 193760
SS 100
11106018
26MAR81/13JAN82
PAGE 11
10602027
13AUG81 500
11AUG83 660
CONDUCT SENSOR T
EST PROGRAM
COST $ 918000
10604037
15JAN80 300
25MAR81 1060
DEVEL TEST TECHNOLOGY FOR IC DATA ACQUIS TECH
COST $ 1159600
SS 200
11106048
29DEC780/29MAR82
PAGE 11
10603C36
15JAN80 300
25MAR81 1200
ANALYZE & TEST OTHER MLT UATION TECHNOLOGIES
COST $ 619800
SS 100
10603016
15JAN80 200
23DEC780 1000
FMGL & DESIGN C
AGE CNGS
COST $ 326900
10603026
29DEC780 300
13JAN82 1000
CONDUCT WHEEL BRNG, M OTOR RESEARCH
COST $ 816900
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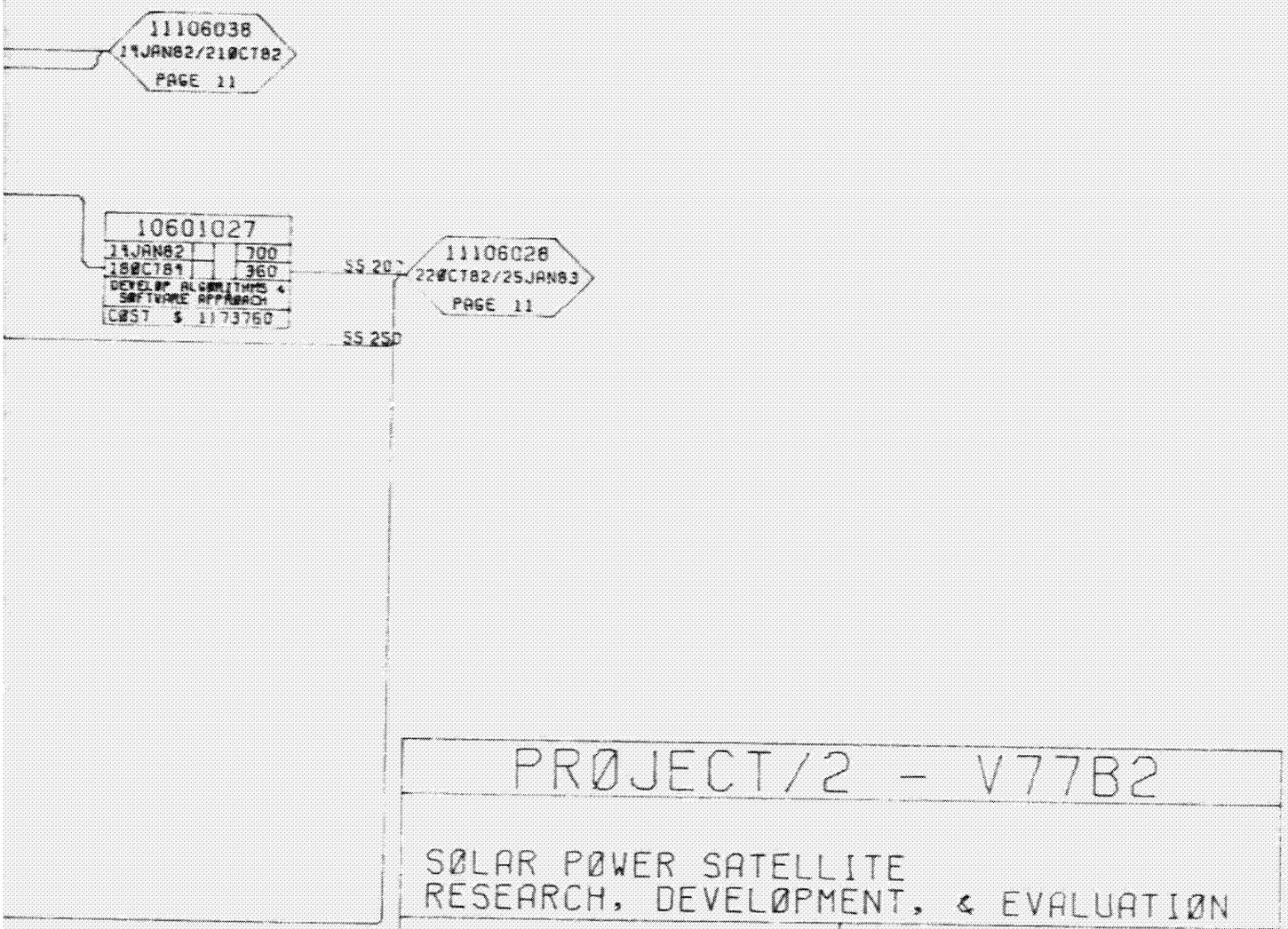


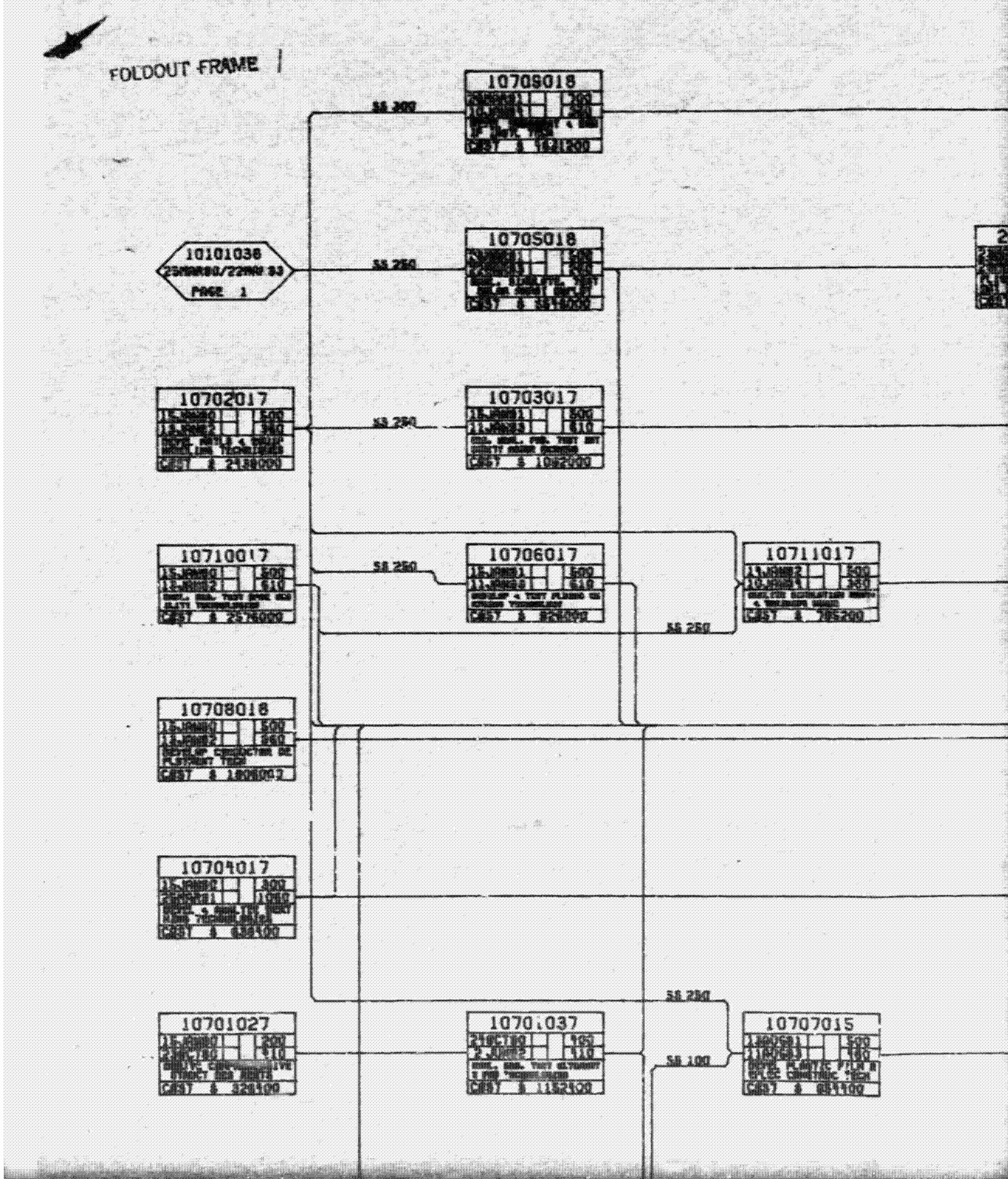
PRØJECT/2 - V77B2

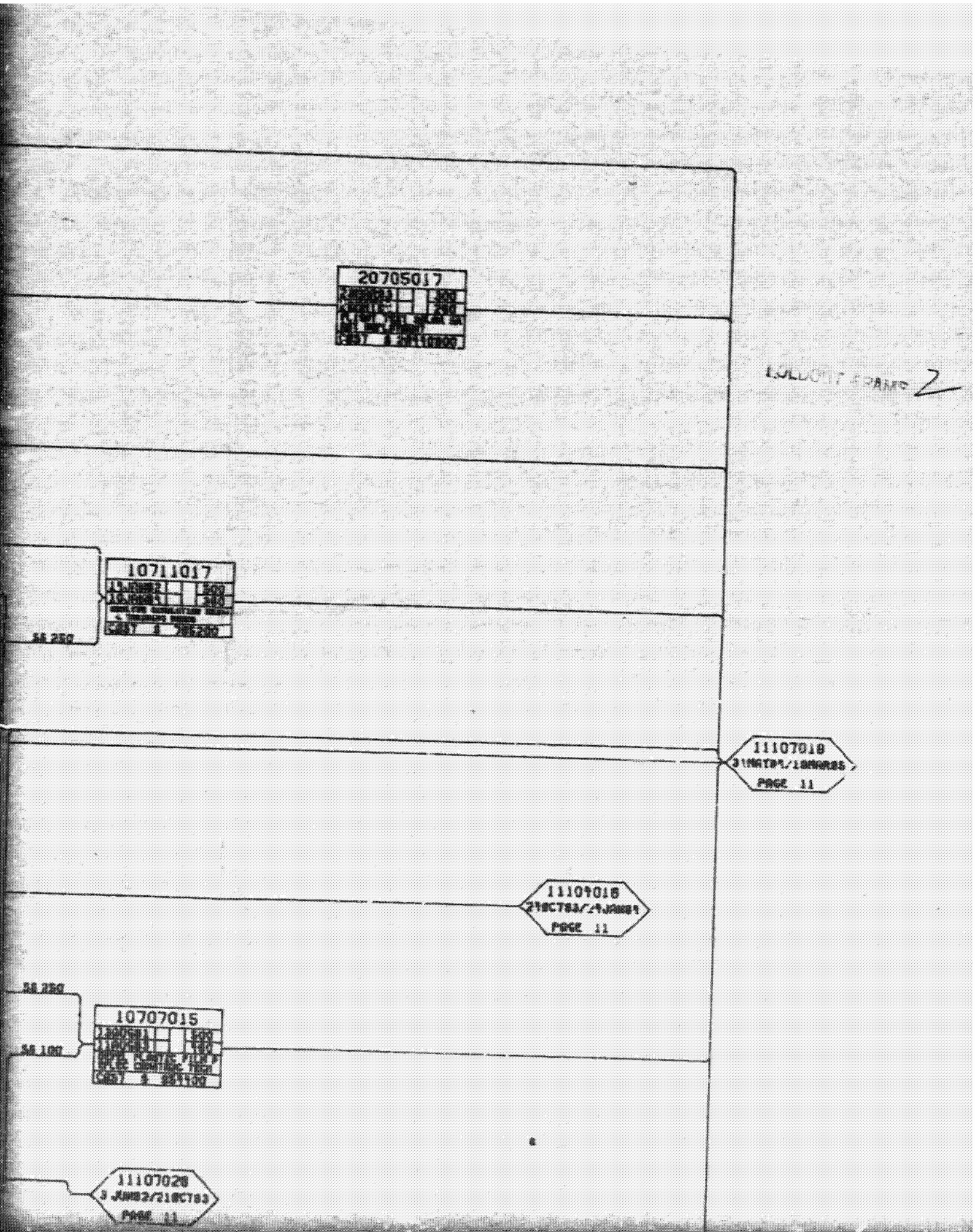
SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT, & EVALUATIØN

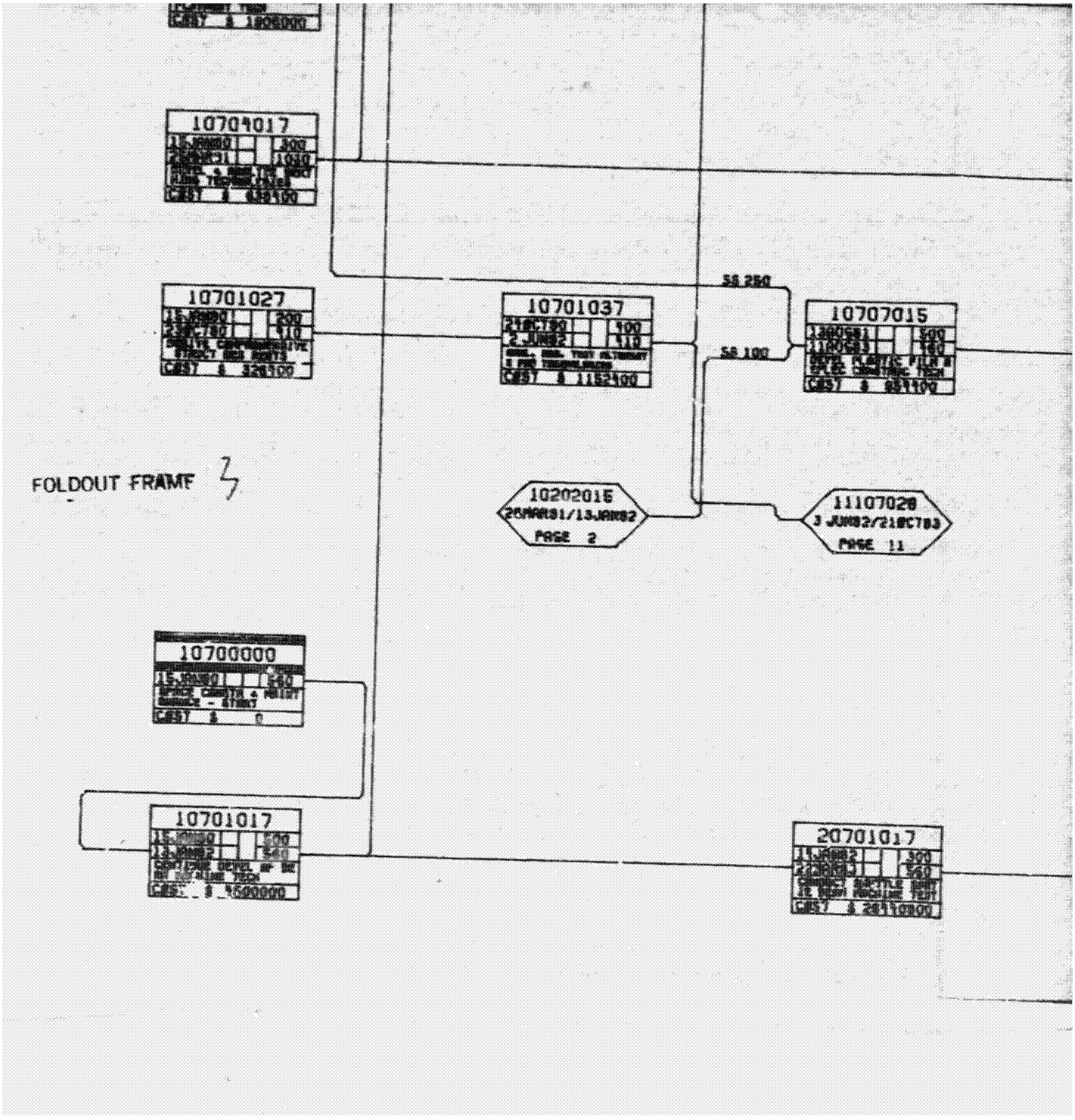
PRØJECT GBER	EJECT CØDE = 6
FLIGHT CØNTRØLS & SYSTEM CØNTRØL	
START DATE 15JAN80	CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979
PLØT 'GBER '	PAGE 6 SHEET 1 / 1

FOLDOUT FRAME 2

FOLDOUT FRAME 1




20705017
LOUDOUN FRAME 2
10711017
SS 250
11107018
PAGE 11
11104016
PAGE 11
SS 250
10707015
SS 107
11107020
PAGE 11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10701027
10701037
10707015
58 250
58 100
FOLDOUT FRAME 7
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26MAR81/13JAN82
PAGE 2
11107020
3 JUN82/21DEC83
PAGE 11
10700000
10701017
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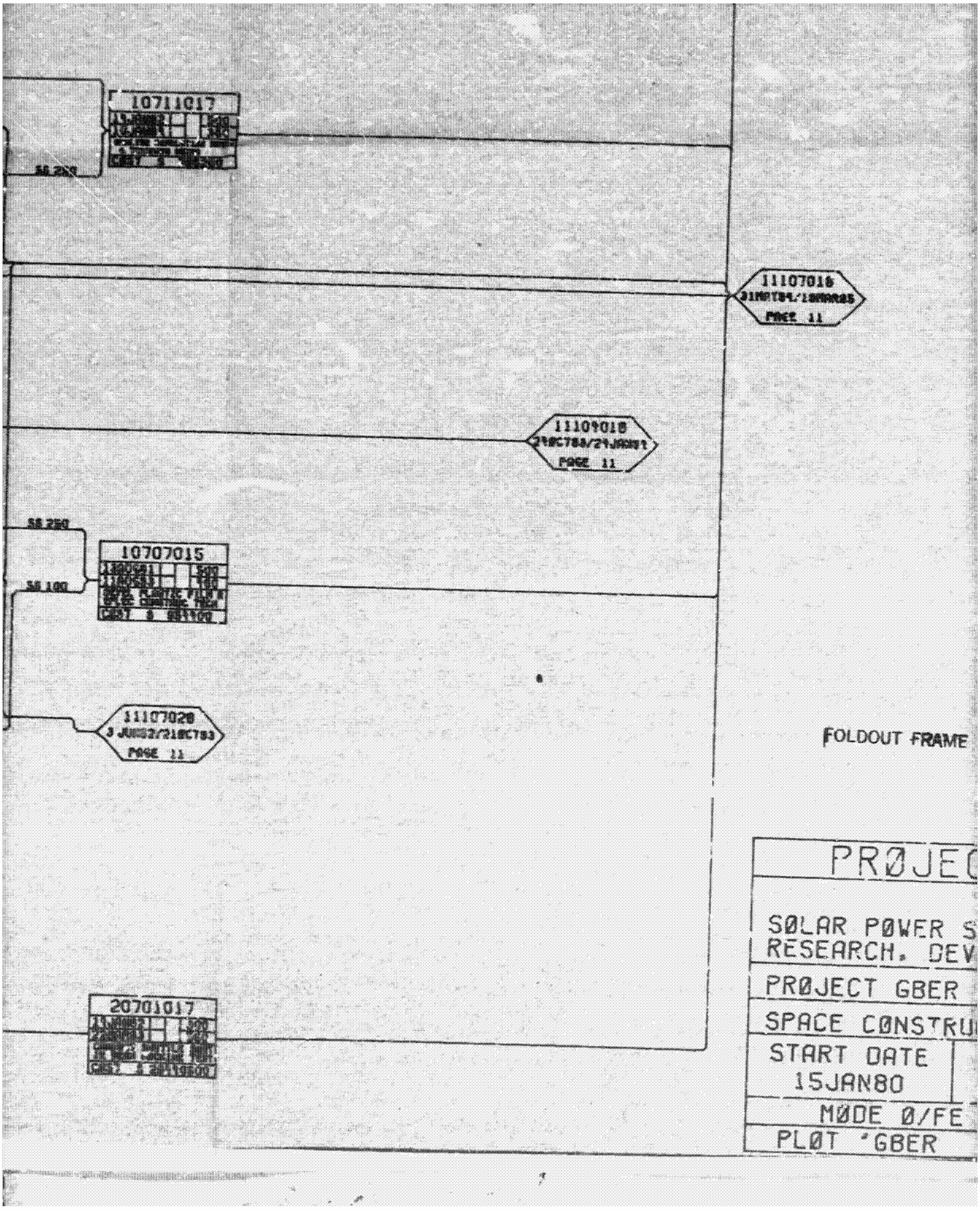
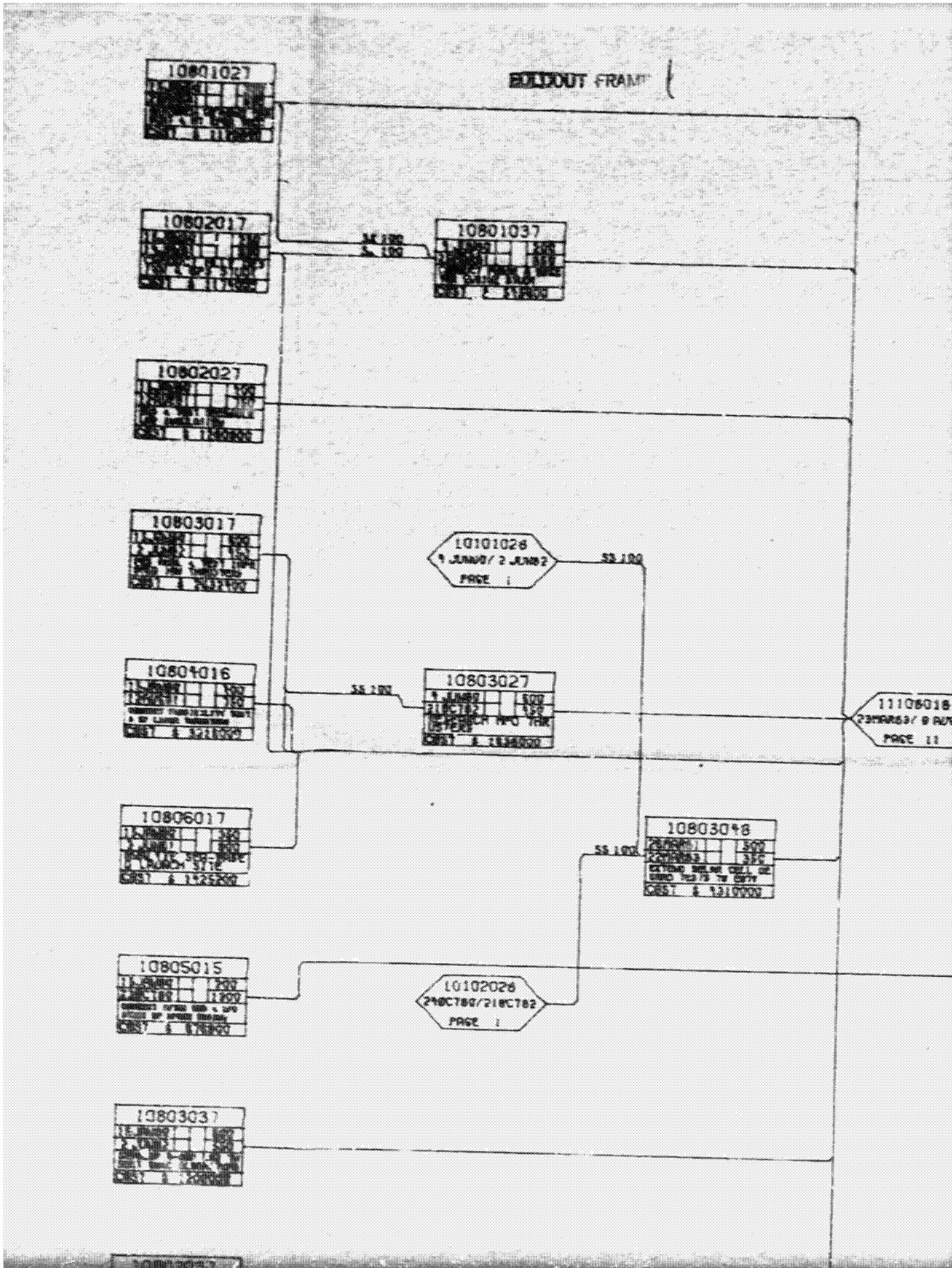

10711017
11107018
PAGE 11
11107018
PAGE 11
10707015
11107020
PAGE 11
20701017
FOLDOUT FRAME
PRØJEC
SØLAR PØWER S
RESEARCH. DEV
PRØJECT GBER
SPACE CØNSTRU
START DATE
15JAN80
MØDE Ø/FE
PLØT *GBER

FOLDOUT FRAME 5

FOLDOUT FRAME 5

PRØJECT/2 - V77B2		
SØLAR PØWER SATELLITE RESEARCH. DEVELØPMENT. & EVALUATIØN		
PRØJECT GBER	EJECT CØDE = 7	
SPACE CØNSTRUCTIØN		
START DATE 15JAN80		CØMPLETIØN 1 APR86
MØDE 0/FE	RUN MAY 25. 1979	
PLØT 'GBER '	PAGE 7 SHEET 1 / 1	


10801027
BULKOUT FRAME
10802017
10801037
10802027
10803017
10101028
PAGE 1
10804016
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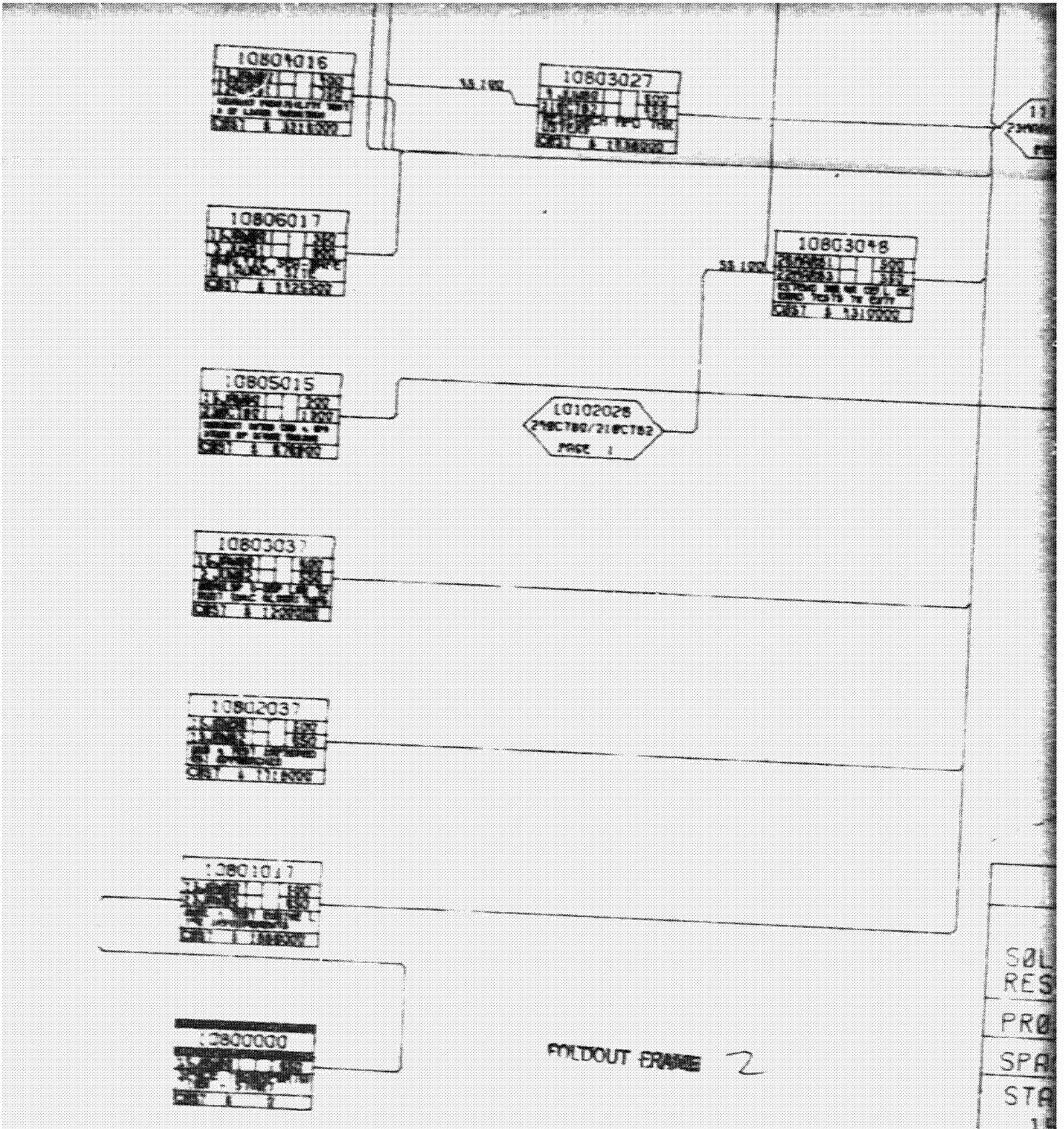
PAGE 11
10806017
10803048
10805015
10102028
PAGE 1
10803037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10802037
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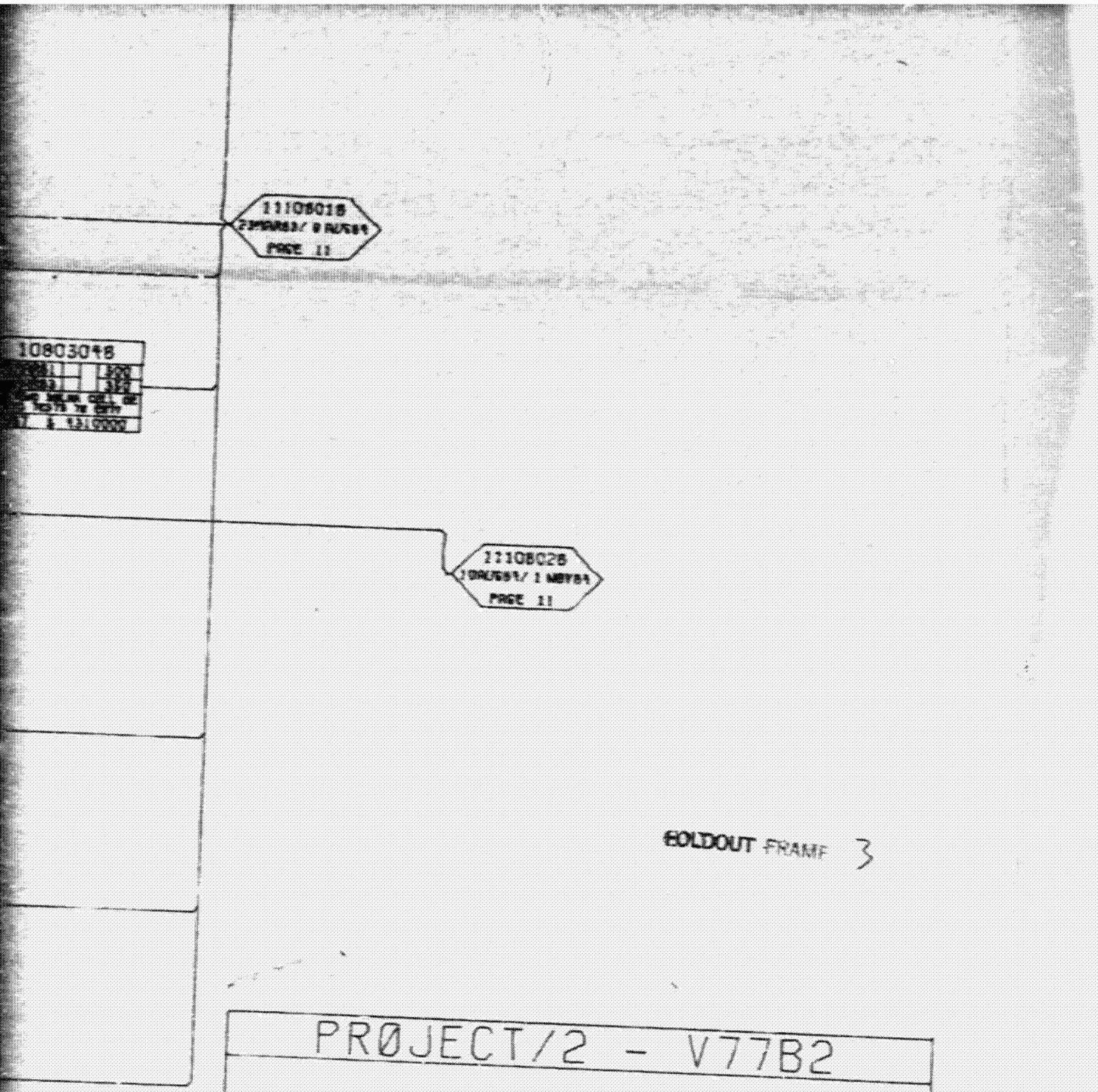

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PROJECT/2 - V77B2		
SOLAR POWER SATELLITE RESEARCH, DEVELOPMENT, & EVALUATION		
PROJECT GBER	EJECT CODE = 8	
SPACE TRANSPORTATION		
START DATE 15JAN80		COMPLETION 1 APR86
MODE 0/FE	RUN MAY 25, 1979	
PLOT 'GBER '	PAGE 8 SHEET 1 / 1	

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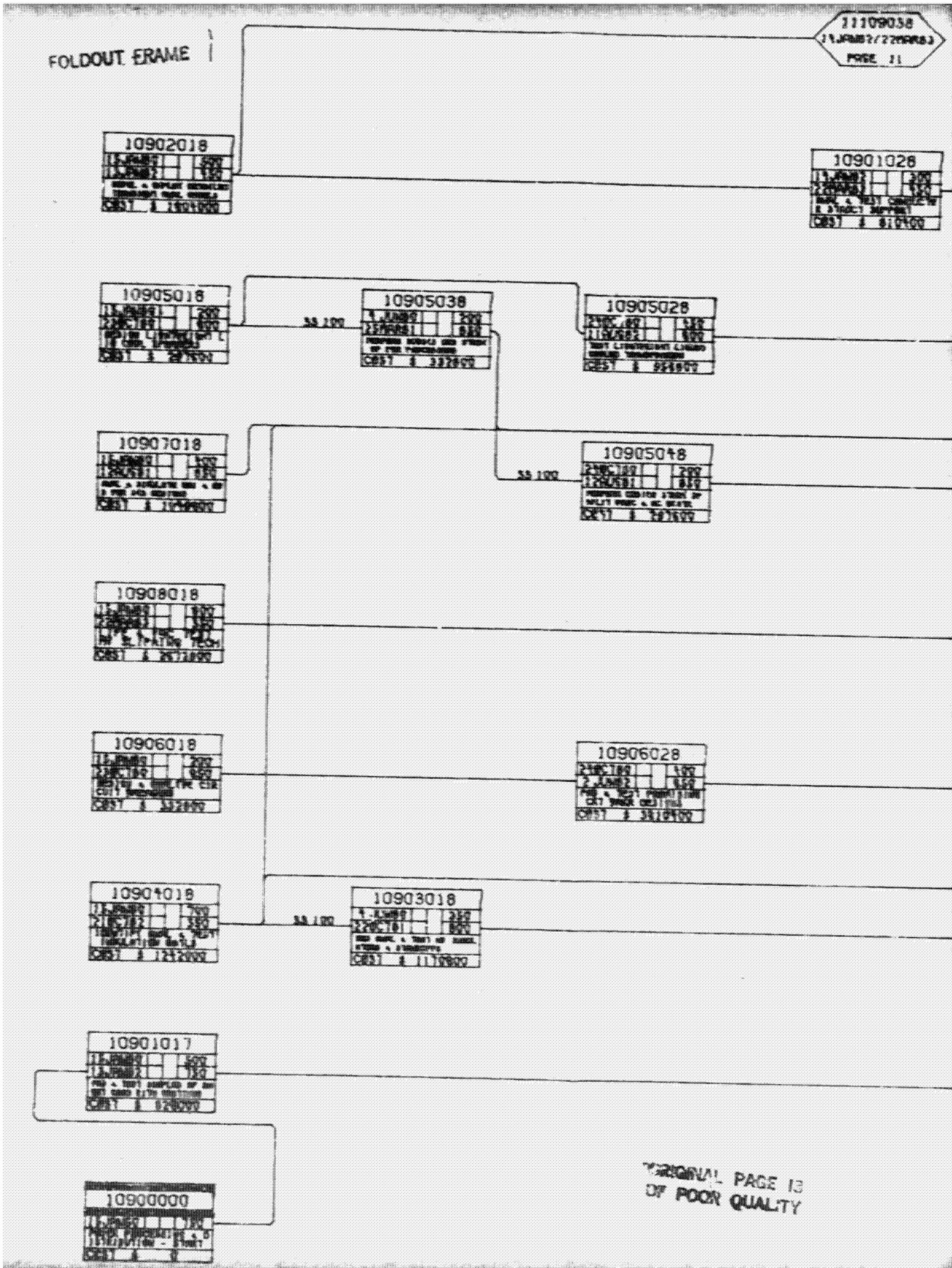
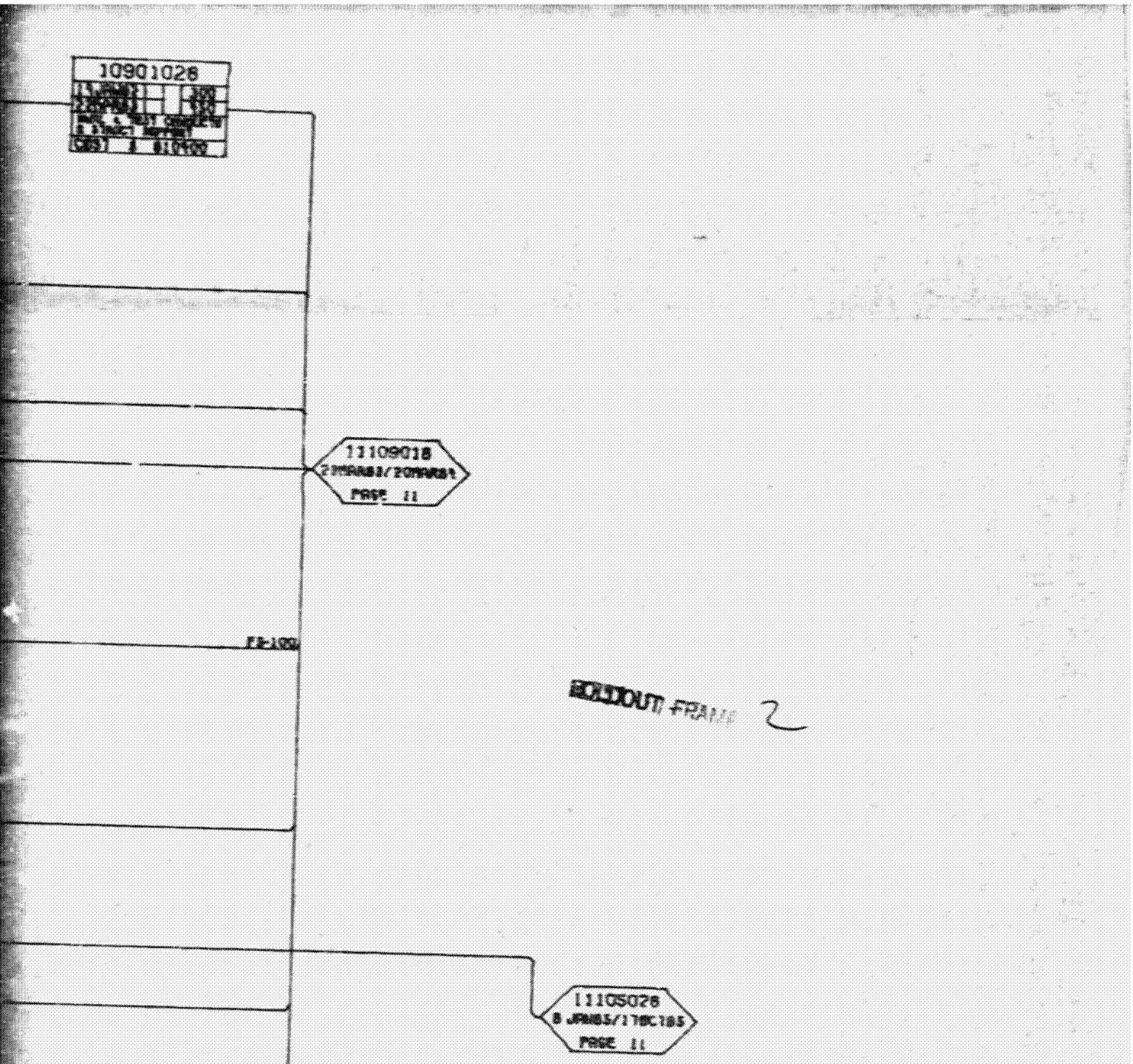
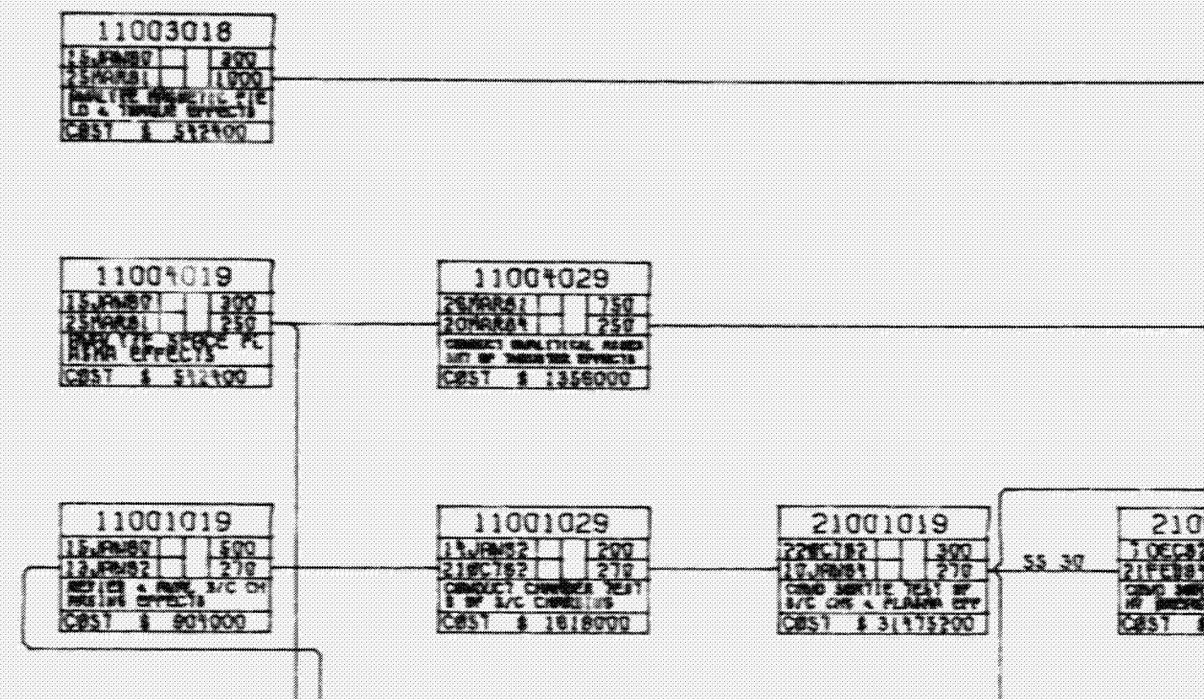




PRØJECT/2 - V77B2

SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT, & EVALUATIØN

PRØJECT GBER	EJECT CØDE = 9
PØWER DISTR & PRØCESSING	
START DATE 15JAN80	CØMPLETIØN 1 APR86
MØDE Ø/FE	RUN MAY 25, 1979
PLØT 'GBER '	PAGE 9 SHEET 1 / 1



PRØJ

SØLAR PØWE
RESEARCH,

PRØJECT GE

SPACE ENVI

START DATE
15JAN80

MØDE Ø

PLØT 'GBE

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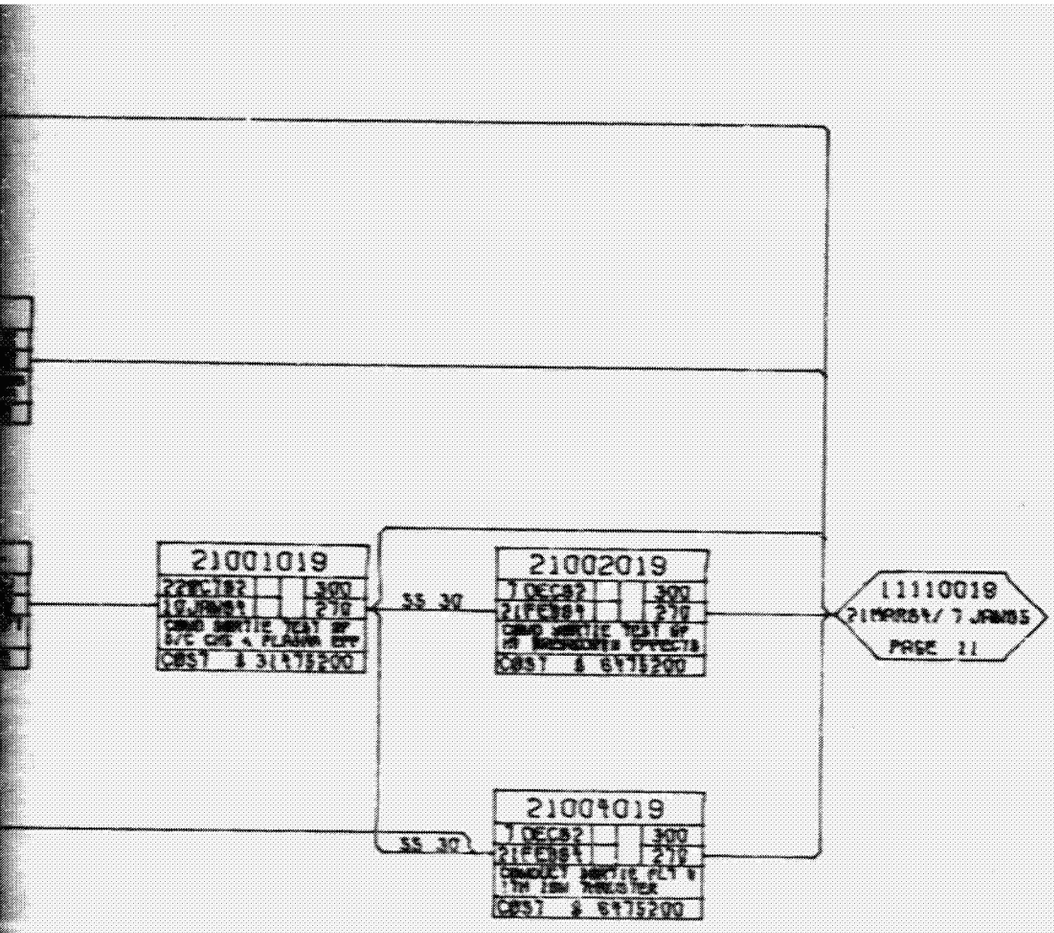

PRØJECT/2 - V77B2

SØLAR PØWER SATELLITE
RESEARCH, DEVELØPMENT, & EVALUATIØN

PRØJECT GBER	EJECT CØDE = 10
SPACE ENVIRØNMENT EFFECTS	
START DATE 15JAN80	CØMPLETIØN 1 APR86
MØDE 0/FE	RUN MAY 25, 1979
PLØT 'GBER '	PAGE 10 SHEET 1 / 1

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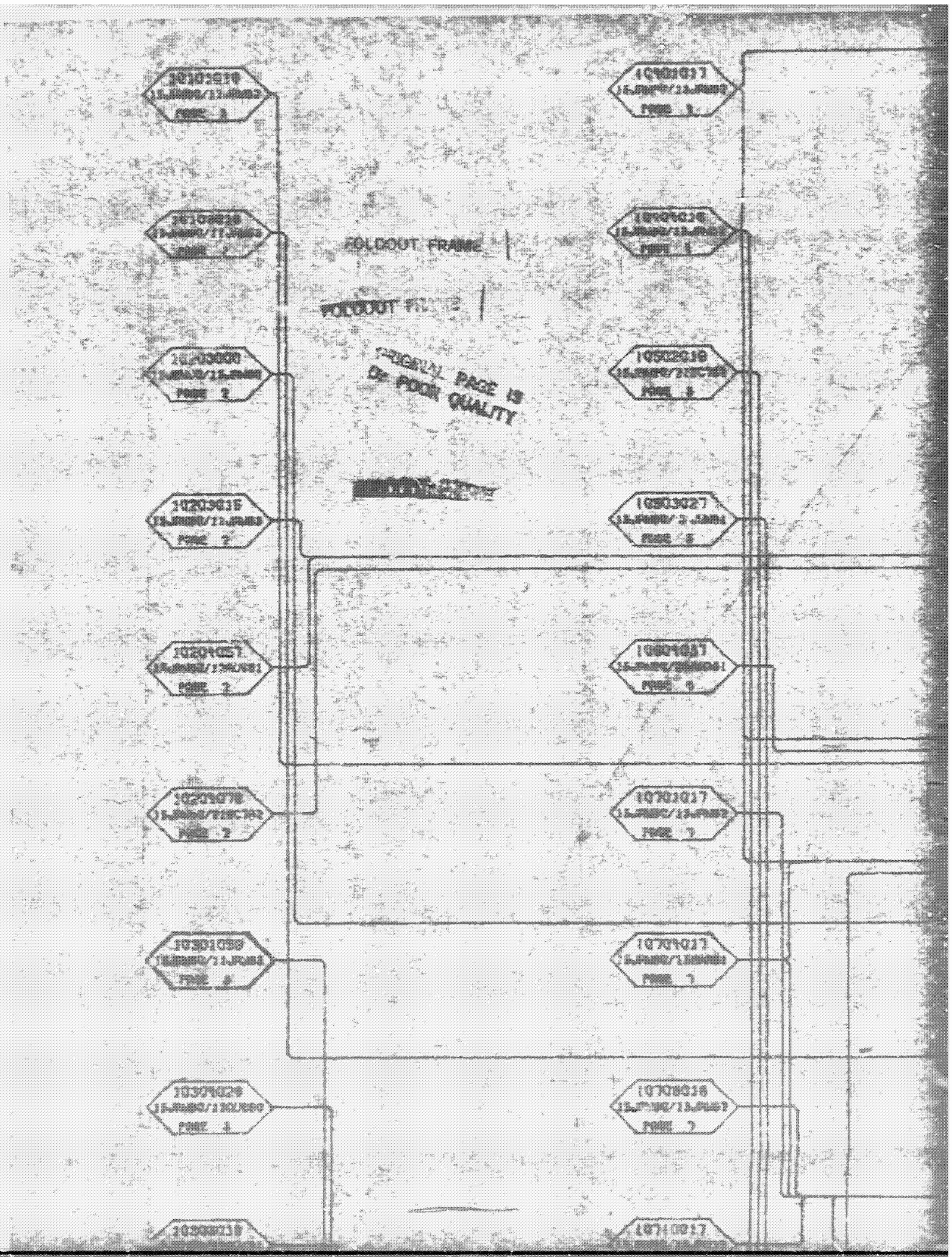
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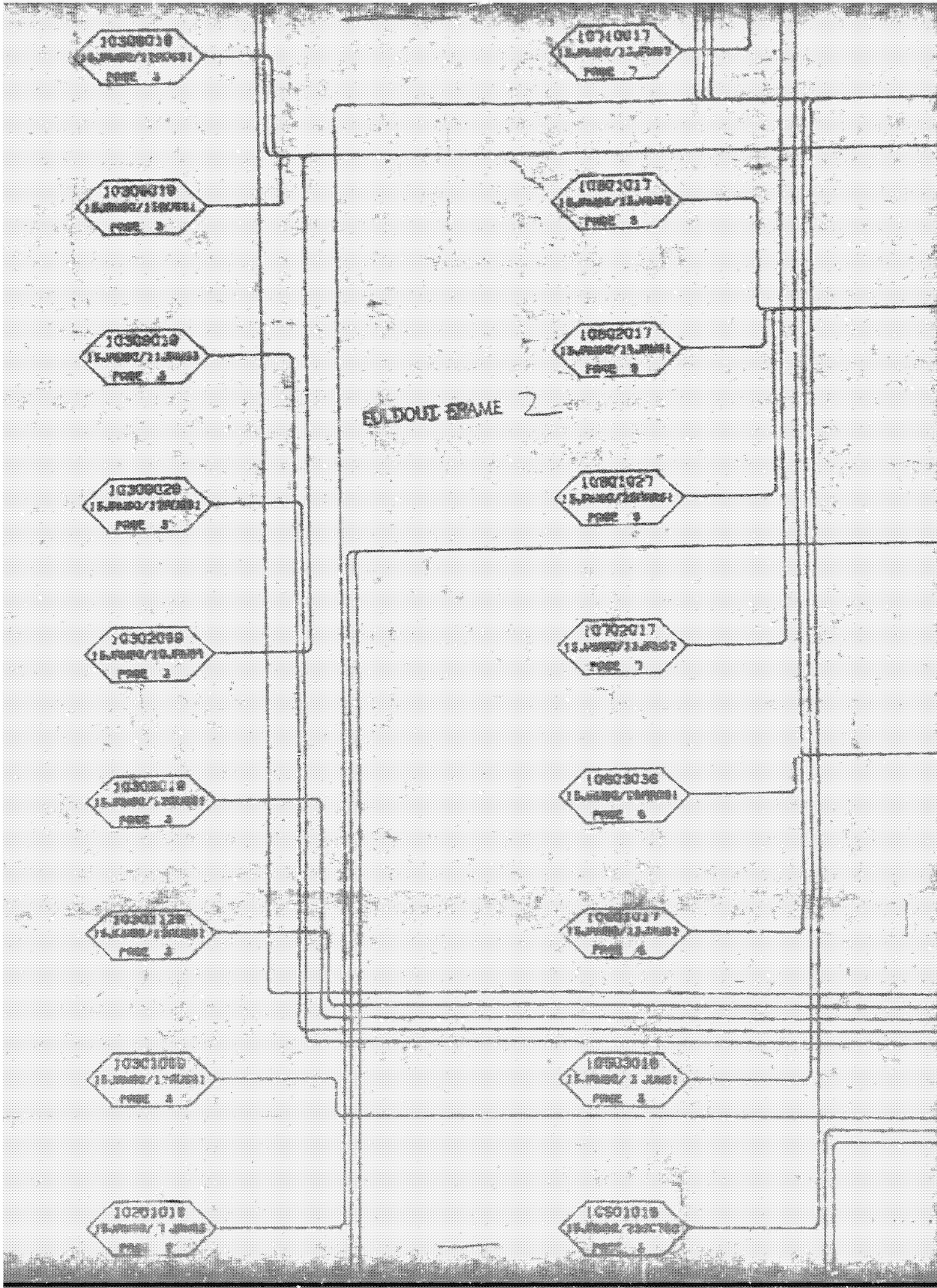
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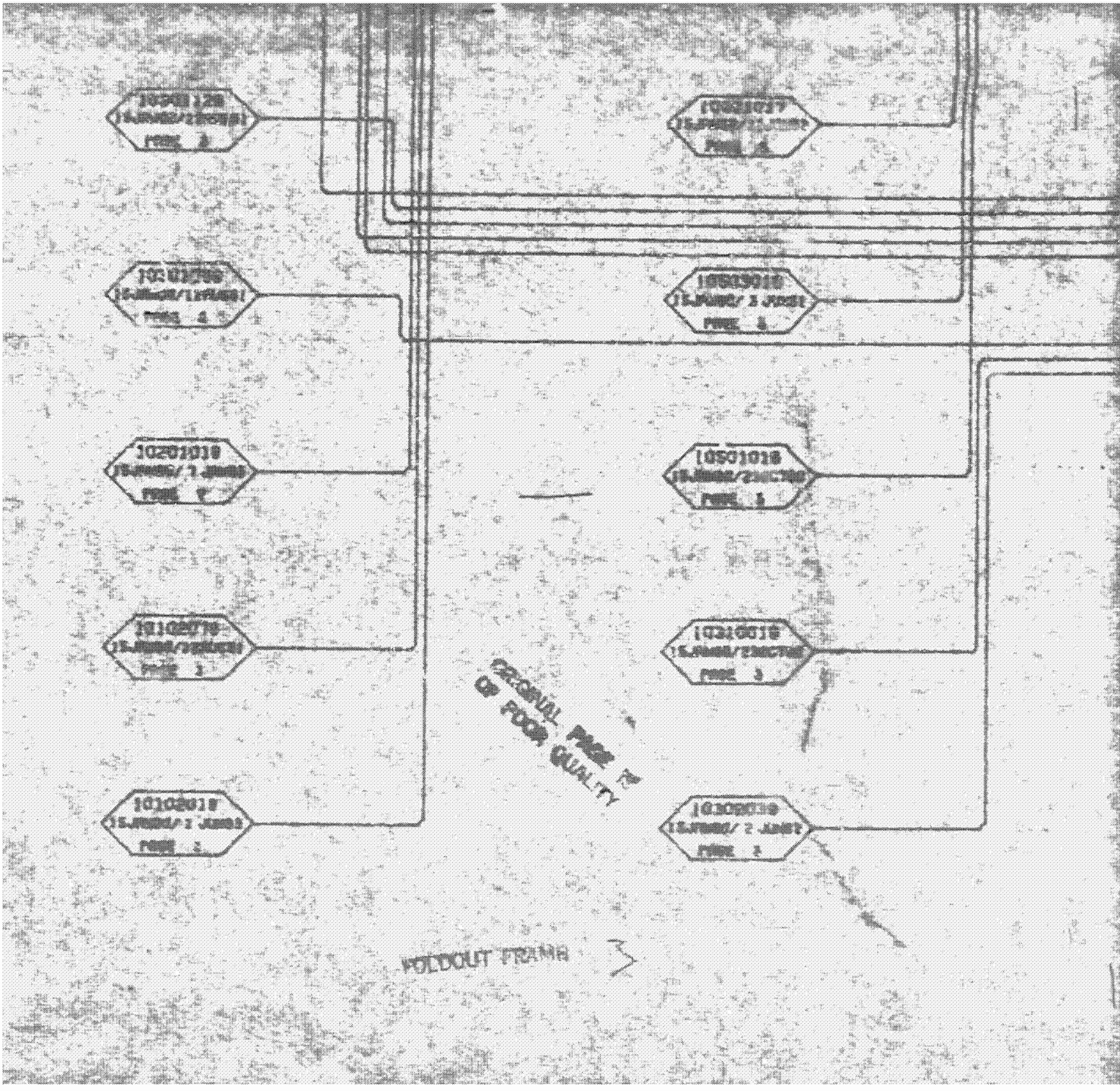
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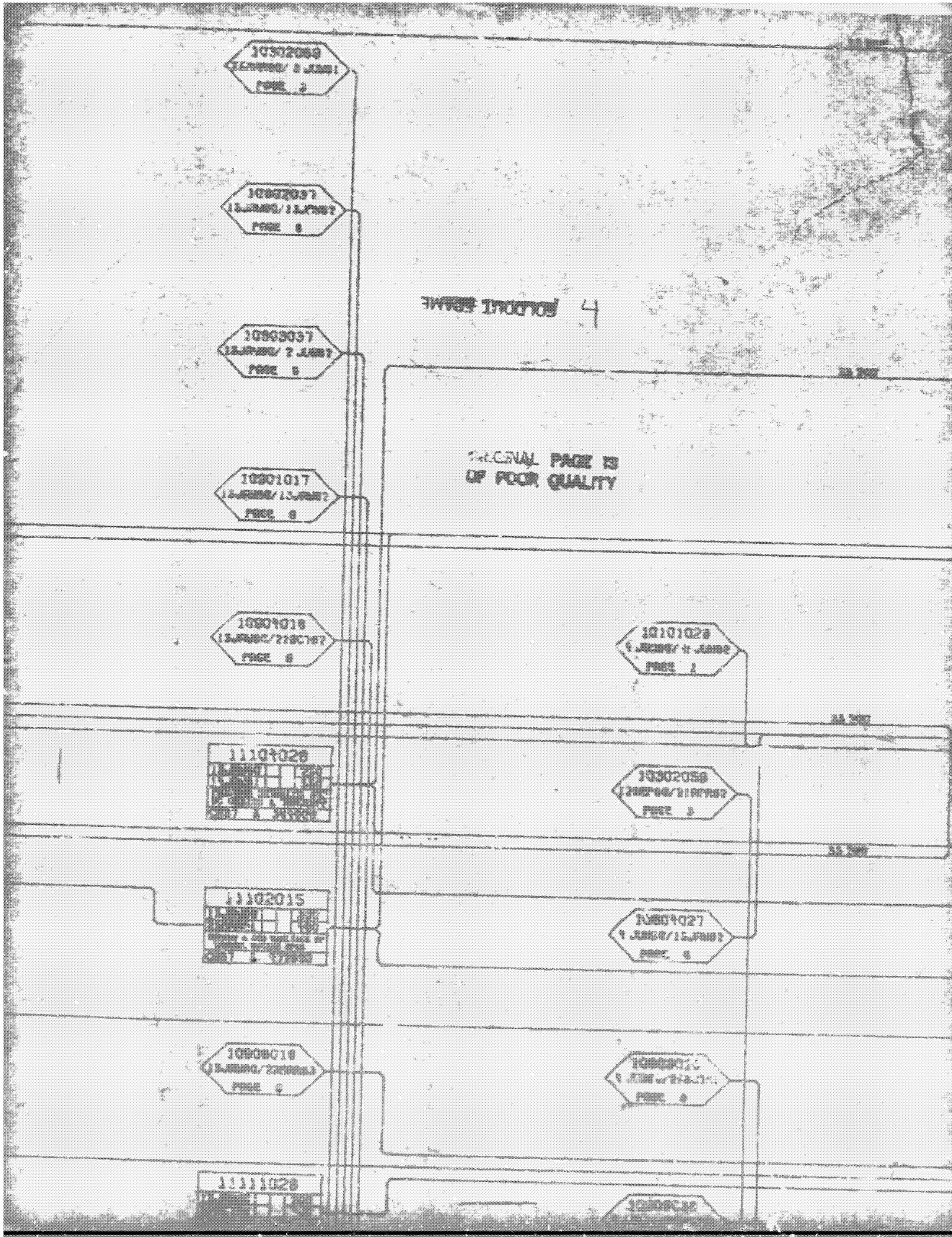

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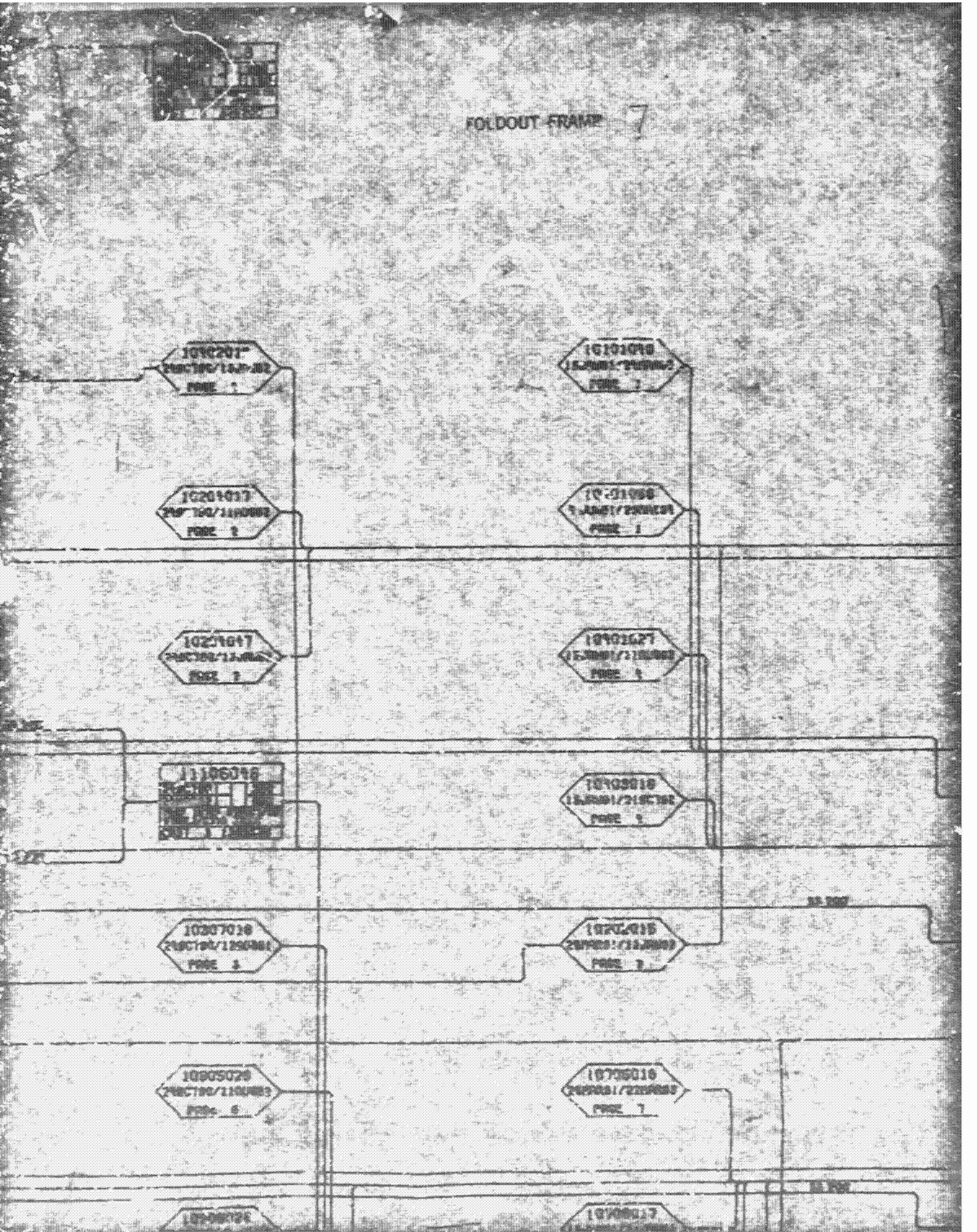
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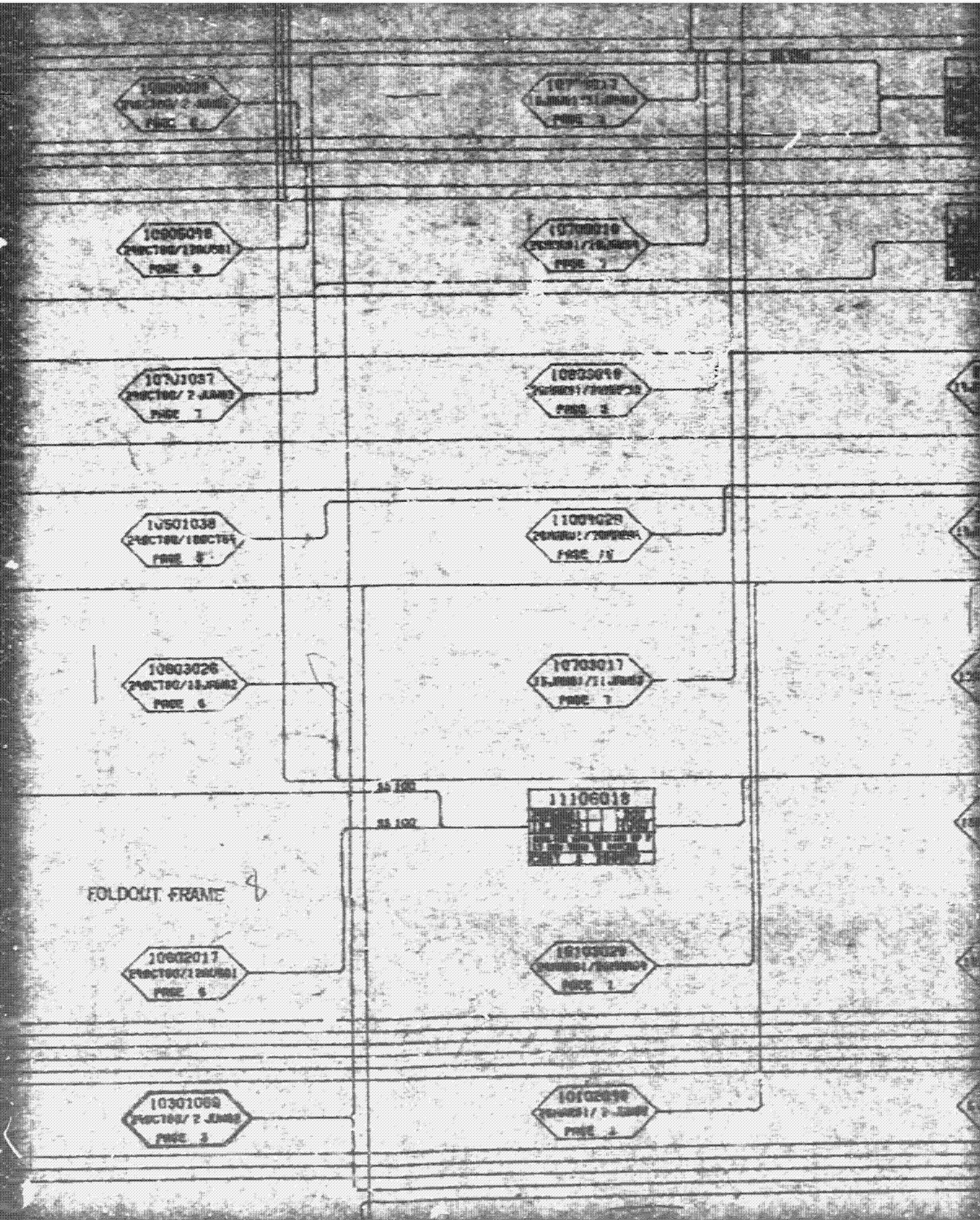
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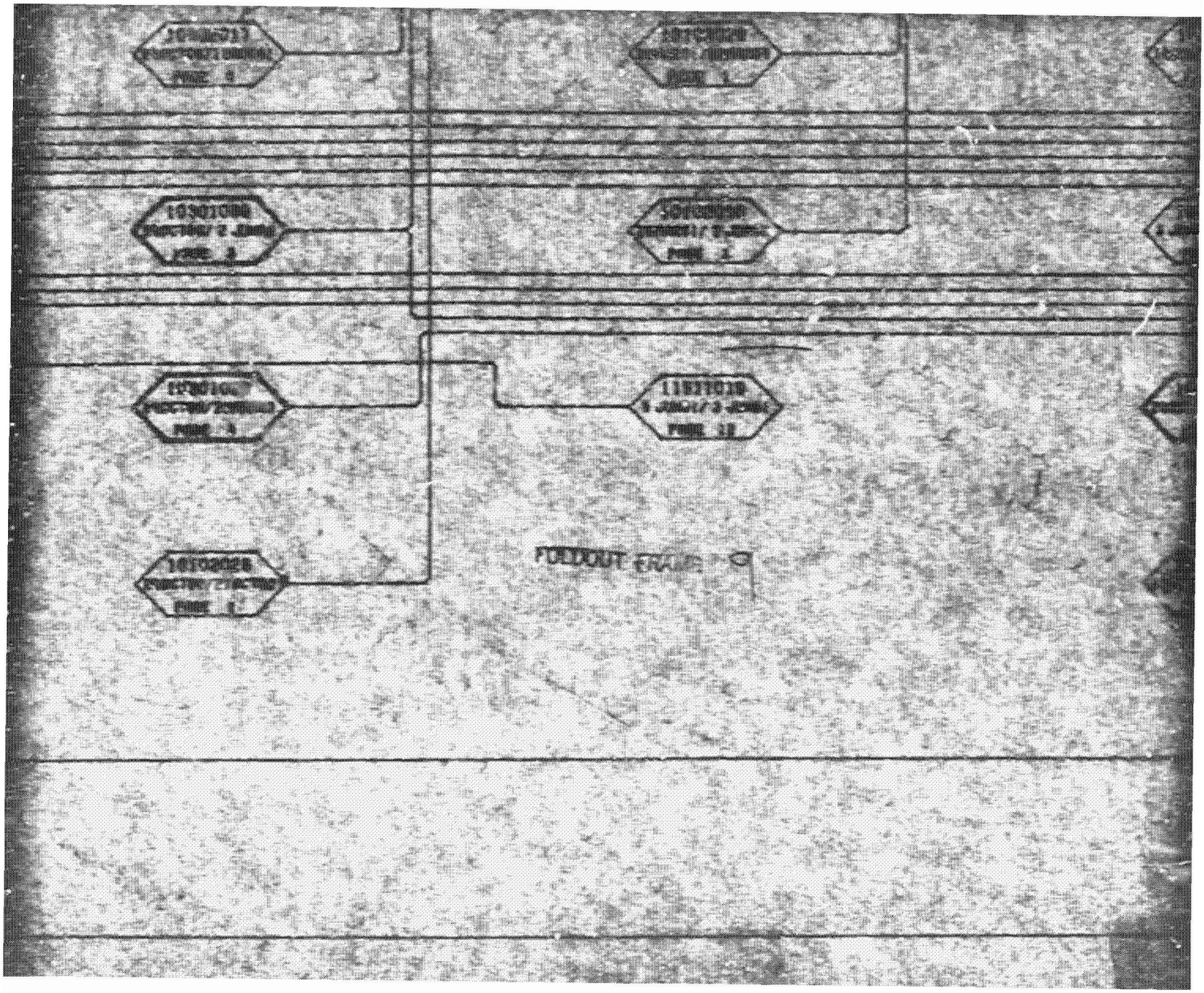

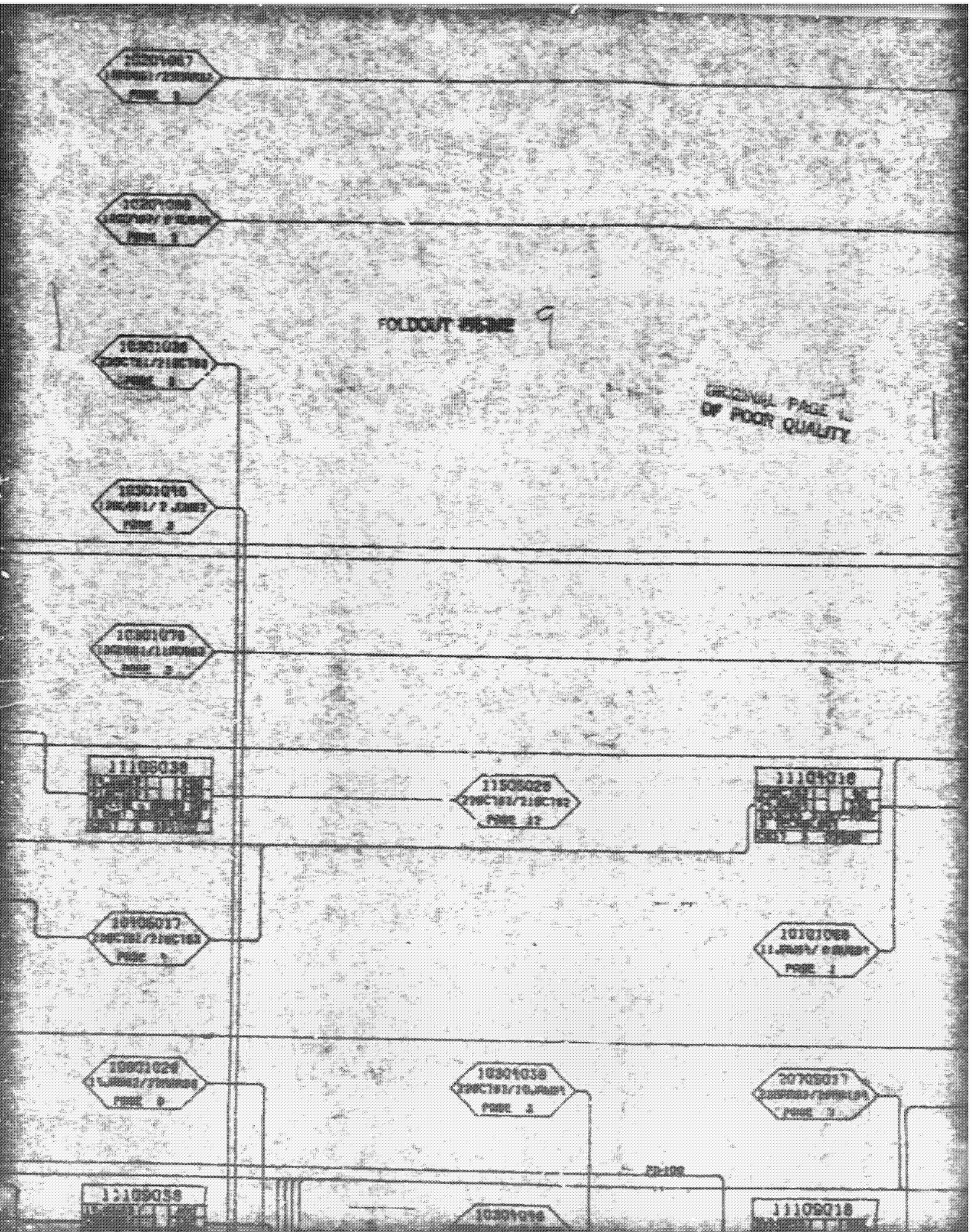
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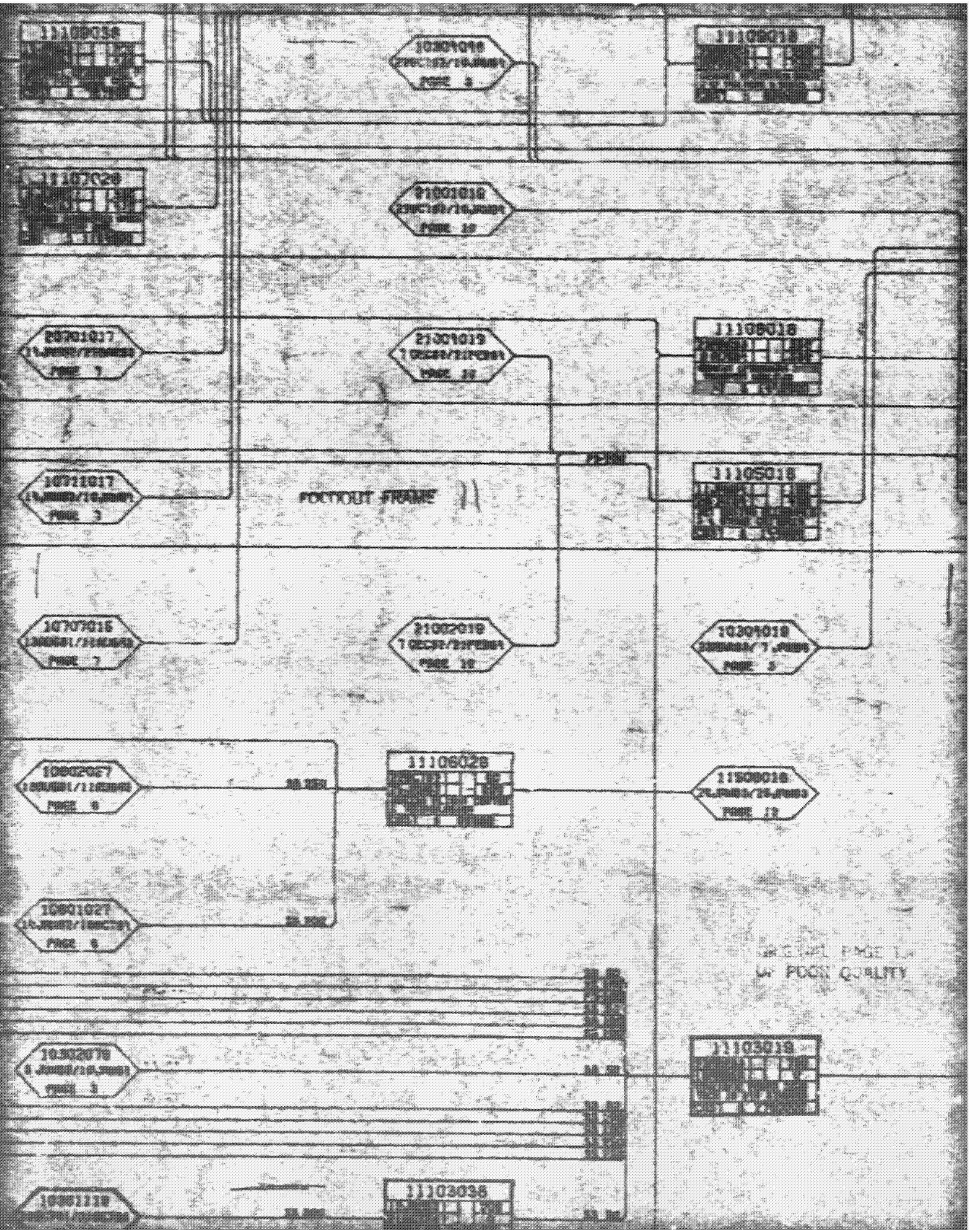

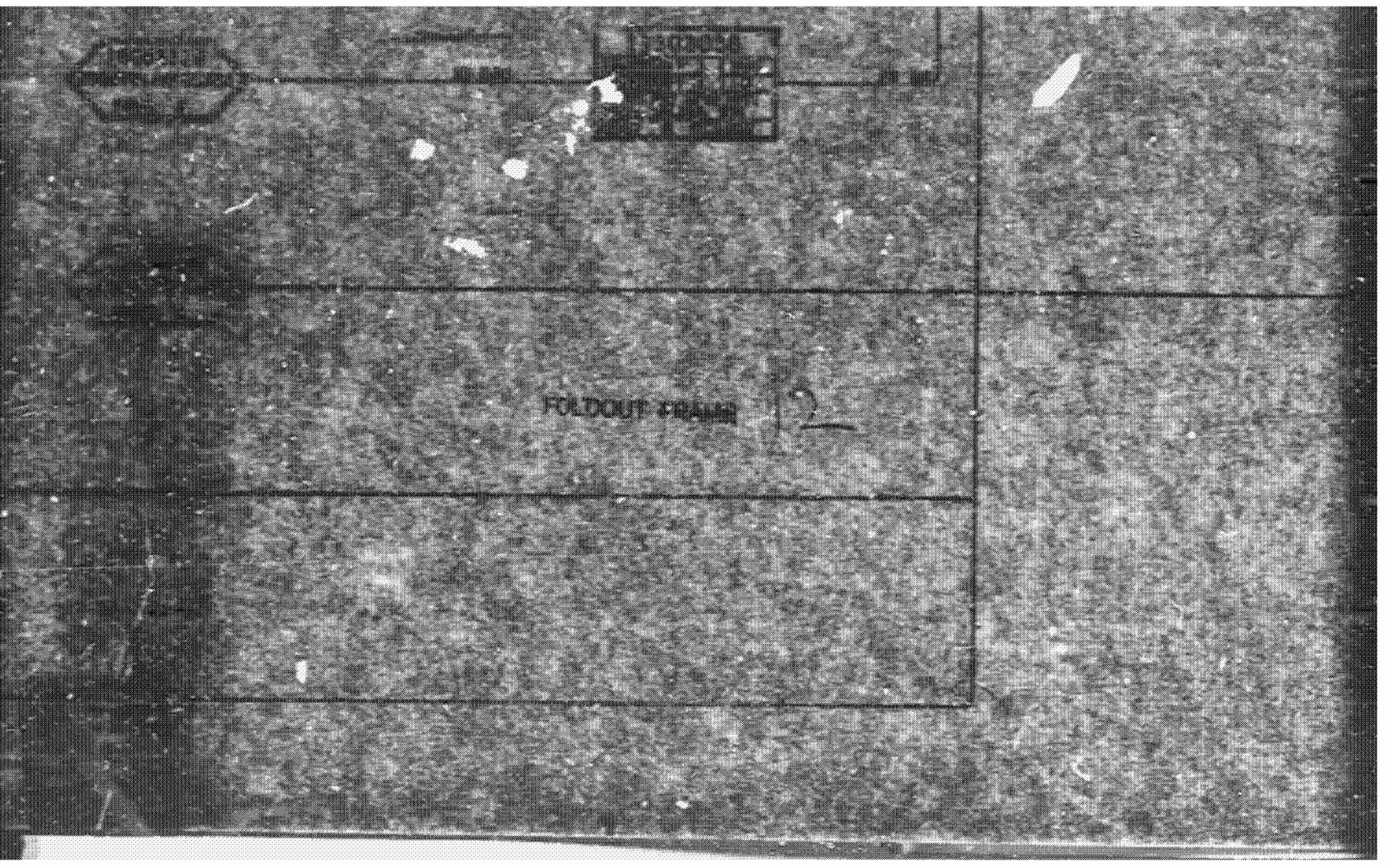
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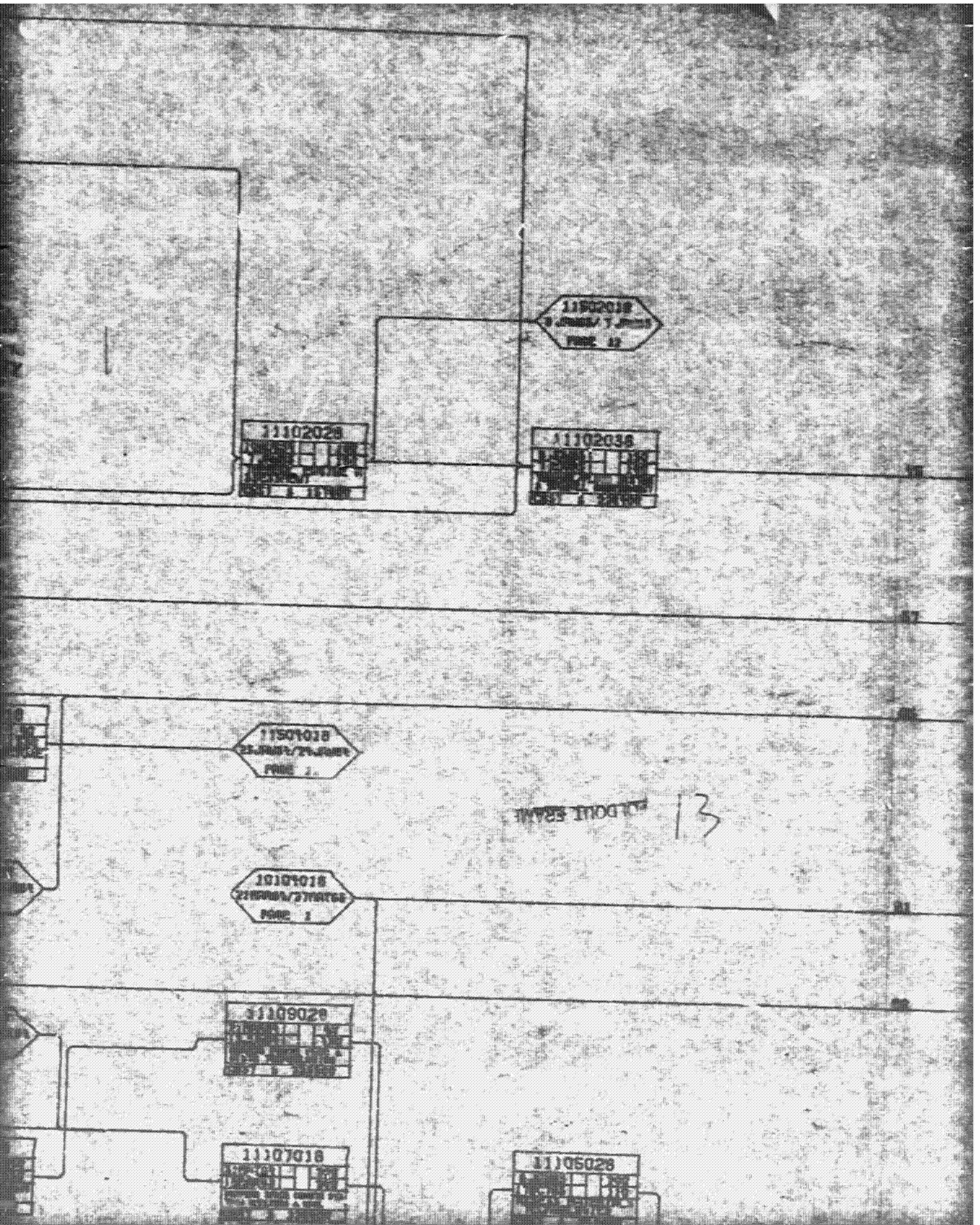
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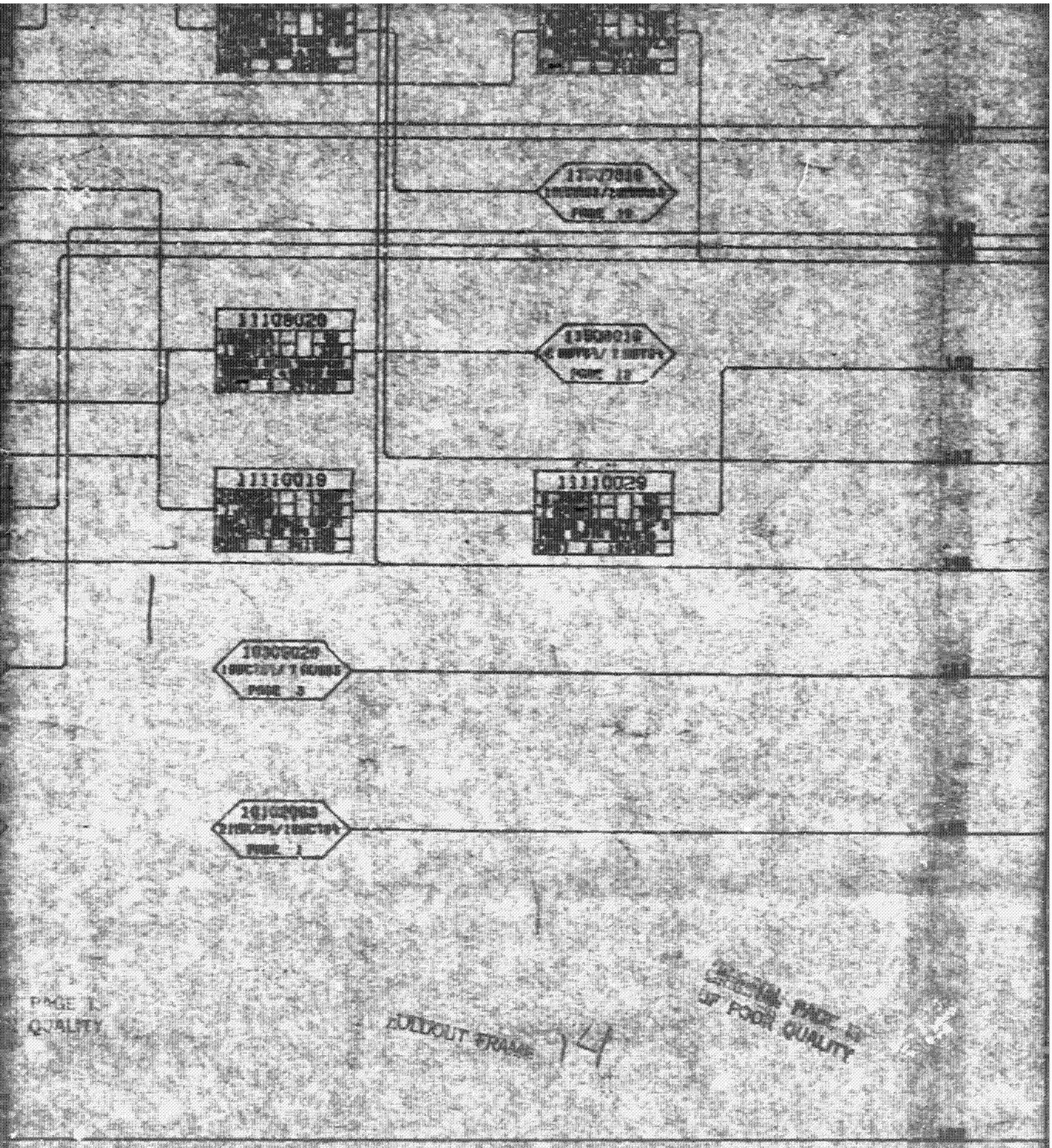

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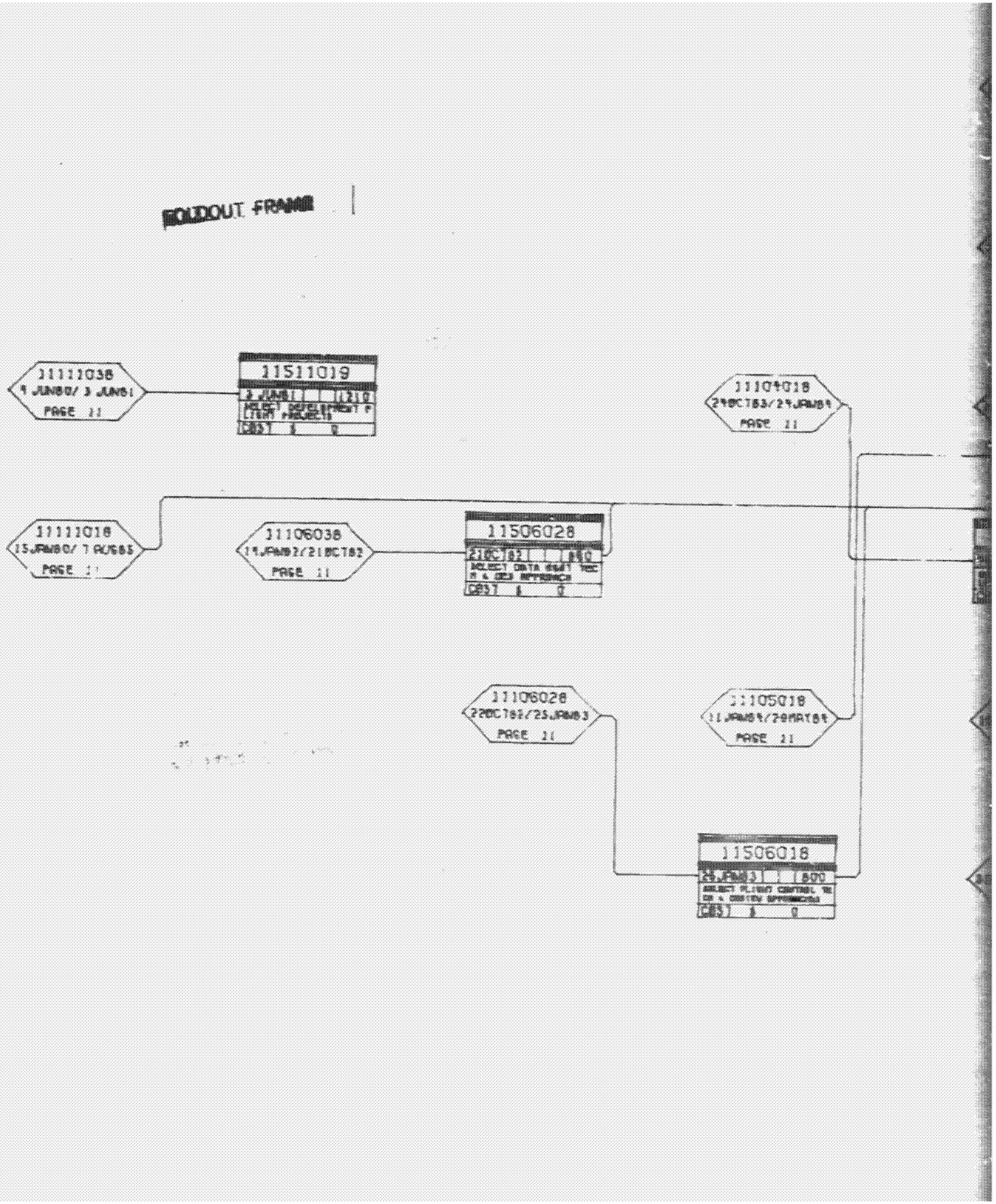

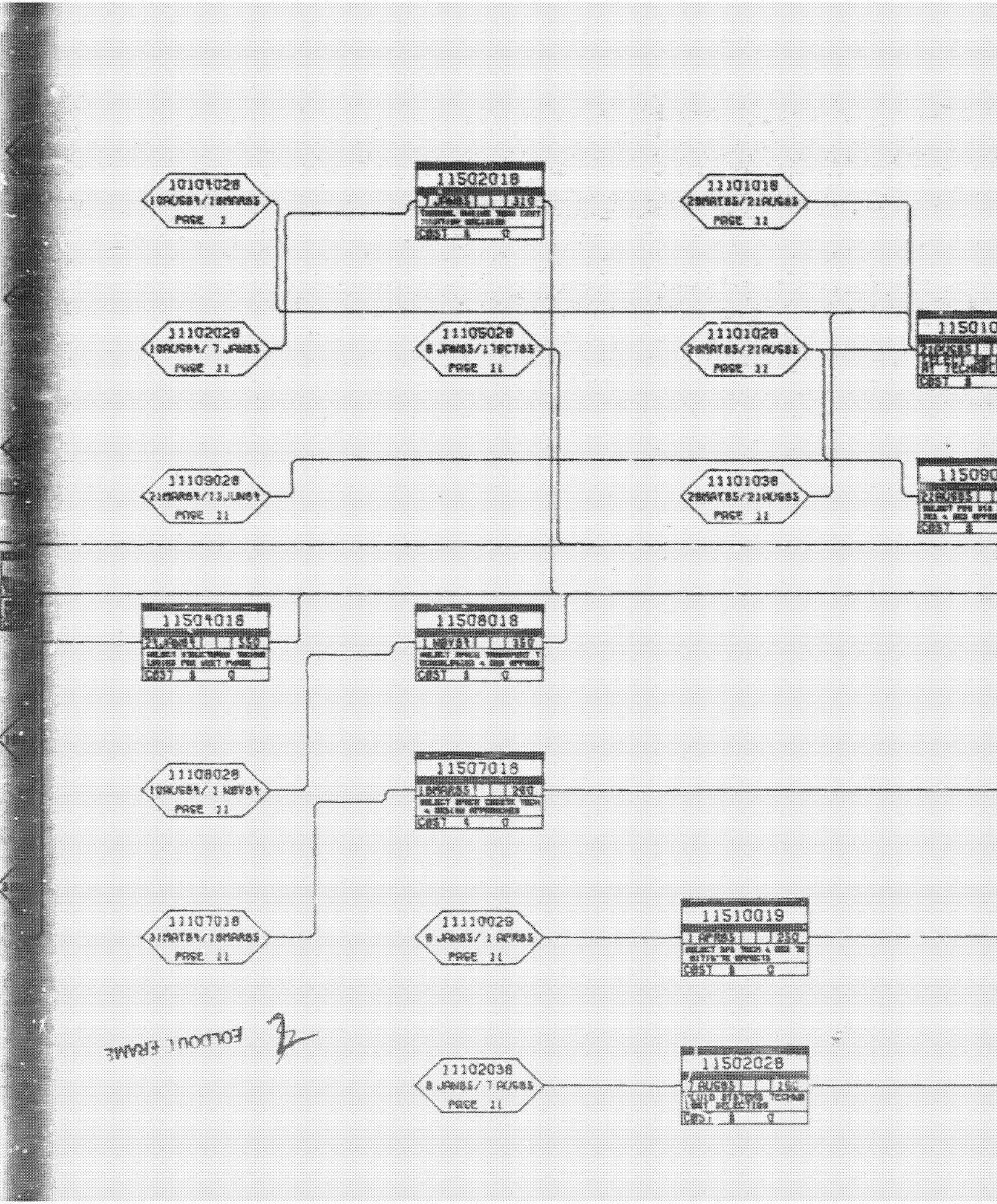
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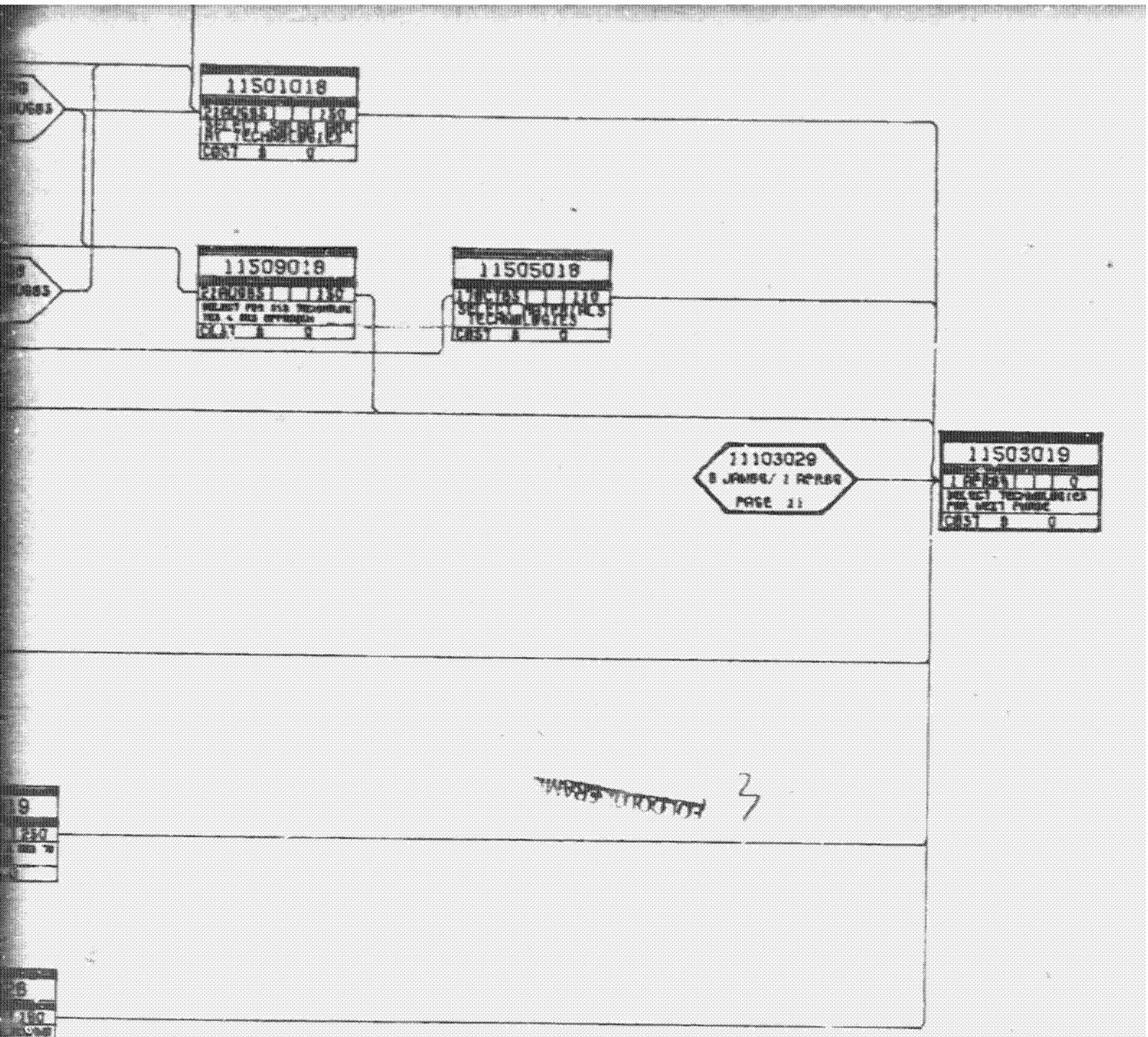

PRØJECT/2 - V77B2		
SØLAR PØWER SATELLITE RESEARCH, DEVELØPMENT, & EVALUATIØN		
PRØJECT GBER		EJECT CØDE = 15
TECHNØLØGY & DESIGN SELECTIØN		
START DATE 15JAN80	*	CØMPLETIØN 1 APR86
MØDE Ø/FE		RUN MAY 25, 1979
PLØT 'GBER '		PAGE 12 SHEET 1 / 1